DOE/EV/10034--T1-Vol.1-Exec.Summ.

DE83 001761

INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENT AND SAFETY RESEARCH FOR FISCAL YEAR 1980 VOLUME I - EXECUTIVE SUMMARY

MASTER

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AI01-79EV10034

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INTRODUCTION

Congress created the Inventory of Federal Energy-Related Environment, Health, and Safety Research in 1974 by passing two Congressional Acts; the Energy Reorganization Act, PL-93-438; and the Federal Non-Nuclear Energy Research and Development Act, PL-93-577. Through this legislation, the Assistant Administrator of the Energy Research and Development Administration (ERDA) was required (1) to establish programs to evaluate the adverse environmental effects of energy development and utilization and (2) to minimize duplication of effort among federal agencies. The Inventory, which began in response to the legislation stated, continued as an annual effort of the Office of the Assistant Secretary for the Environment, Department of Energy (DOE). The Federal Inventory project terminates with this year's FY 1980 publication. Since the publication of the initial Inventory in October 1975, the Inventory has been improved in scope and content to better represent federally funded energy-related environment, health, and safety research.

The FY 1980 Federal Inventory contains information on 3603 federally funded energy-related environmental, health, and safety research projects. The Inventory is published in two volumes: Volume I, an executive summary and overview of the data; and Volume II, project listings, summaries, and indexes.

Project information for the FY 1980 Inventory was collected from federal agencies using the questionnaire shown in Appendix B. This was a revision to the FY 1979 questionnaire format, designed to aid the respondent and to provide a more accurate and meaningful expression of project data. In doing so, the biological and environmental R&D and assessments category was shortened by dropping the subcategories under "Biological Effects in Experimental Systems." Also, the energy technology category was greatly expanded to allow for a more detailed

identification of technologies. Federal offices submitting project data were:

Council on Environmental Quality
Department of Agriculture
Department of Commerce
Department of Defense
Department of Energy
Department of Health and Human Services
Department of Housing and Urban Development
Department of the Interior
Environmental Protection Agency
National Aeronautics and Space Administration
National Science Foundation
Nuclear Regulatory Commission
Office of Technology Assessment
Tennessee Valley Authority

In addition to providing an overview of federally funded energy-related environmental, health, and safety research, the Inventory also breaks out research sponsored by various federal agencies and the amount of funding provided by each in various research categories. The format and indexes employed in the Inventory allow for efficient access to information compiled.

The FY 1980 Federal Inventory serves as a valuable resource for the scientific community and for individuals and organizations interested in the role of federal government in supporting energy-related environmental, health, and safety research.

Appendix A provides directions for user access to the Federal Inventory Data Base. Appendix C provides a complete list of responding and funding agency abbreviations.

OVERVIEW OF INVENTORY DATA

The data collected by the Federal Inventory have been organized and presented in tables and figures to allow for interpretation and understanding by the user. The information expressed has been analyzed to show emphases and trends in energy-related environmental, health, and safety research and development during FY 1980. This effort resulted in a profile of the research activities funded by federal agencies and departments. It is possible to describe the pollutants and environmental issues of concern and to identify the energy technologies and research categories receiving major support in the area of energy-related research and development. Analysis of the Federal Inventory data also includes a description of each funding agency's interests and priorities in the area of energy-related research.

Tables 1 and 2 illustrate federal agency participation in the FY 1980 Federal Inventory. Table 1 offers a tabulation of projects and funding administered by responding agencies, while Table 2 provides a listing of the actual funding reported by each supporting agency. The data illustrate that the leading agencies involved in energy-related environmental, health, and safety research and development were DOE and the Environmental Protection Agency (EPA). In terms of actual dollar support, DOE accounted for more than 55% of the FY 1980 reported funding, while EPA accounted for 17% of the dollar total. In terms of actual projects supported, EPA, funding 1320 projects, was the most active agency, followed by DOE, which funded 998 energy-related projects.

One major effort of the Inventory is to define and categorize the type of projects involved in energy-related research. According to the questionnaire format, the Research and Development (R&D) categories are Environmental and Safety Control Technology, Technology Impacts Overview and Assessment, and Biological and Environmental R&D and Assessments. Figure 1 offers a graphic representation of the proportion of the FY 1980 reported dollars allocated for each R&D category. The amounts budgeted for Technology Impacts Overview and Assessment (IO) and

TABLE 1. FEDERAL ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT DOLLARS AND PROJECTS PROVIDED BY RESPONDING AGENCY FOR FISCAL YEAR 1980

Responding Agency	Number of Reported Projects	Number of Projects With No Funds Reported	Total Funds Reported ($1000's)
Council on Environmental Quality	1	1	0
Department of Agriculture	184	184	0
Department of Commerce	61	7	36,367
Department of Defense	6	0	1,438
Department of Energy	959	21	508,537
Department of the Interior	232	30	61,871
Department of Transportation	51	21	7,187
Environmental Protection Agency	1,231	382	152,740
Department of Health and Human Services	523	168	33,674
Department of Housing and Urban Development	12	6	9,275
National Aeronautics and Space Administration	5	1	9,499
Nuclear Regulatory Commission	172	0	86,312
National Science Foundation	61	13	7,968
Office of Technology Assessment	2	0	53
Tennessee Valley Authority	103	15	10,106
Total	3,603	849	925,027

TABLE 2. FEDERAL AGENCY FUNDING OF ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT IN PROJECTS AND DOLLARS FOR FISCAL YEAR 1980

Funding Agency	Number of Projects	Dollars ($1000's)
Council on Environmental Quality	1	0
Department of Agriculture	185	460
Department of Commerce	19	9,597
Department of Defense	11	1,897
Department of Energy	998	513,042
Department of the Interior	232	80,393
Department of Transportation	51	6,056
Environmental Protection Agency	1,320	160,673
Department of Health and Human Services	513	31,680
Department of Housing and Urban Development	12	9,275
National Aeronautics and Space Administration	10	9,993
Nuclear Regulatory Commission	181	87,254
National Science Foundation	61	7,425
Office of Technology Assessment	2	53
Other[a]	5	3,570
Tennessee Valley Authority	60	3,659
Total	3,661[b]	925,027

[a]Partial or complete funding for various projects was provided by nonfederal organizations. These are grouped under the term "Other."

[b]The total number of projects is greater than the actual number of projects, 3603, since a project can have more than one funding agency.

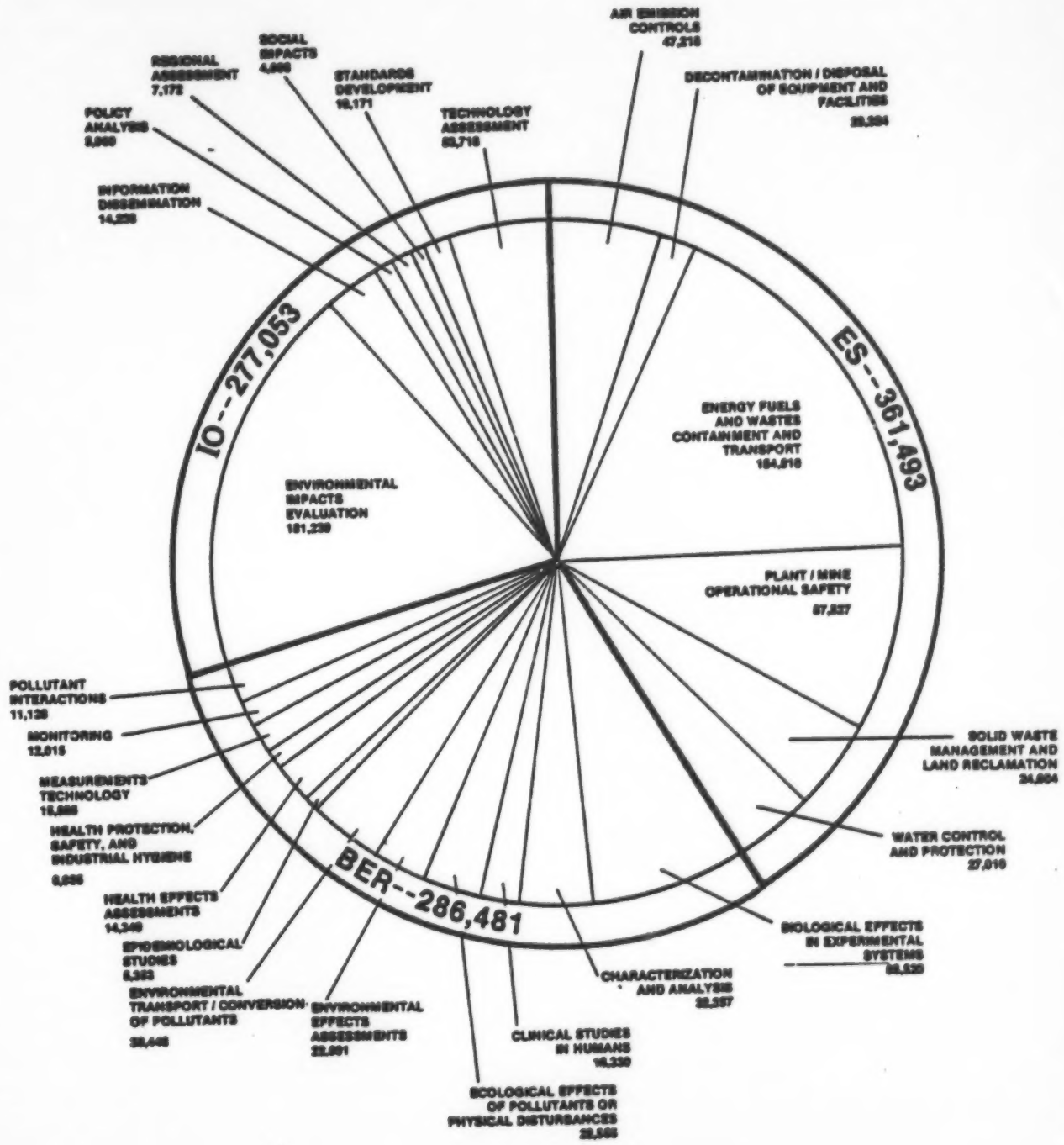
AIR EMISSION CONTROLS 47,216
SOCIAL IMPACTS 4,966
REGIONAL ASSESSMENT 7,172
STANDARDS DEVELOPMENT 16,171
DECONTAMINATION / DISPOSAL OF EQUIPMENT AND FACILITIES 39,594
POLICY ANALYSIS 5,060
TECHNOLOGY ASSESSMENT 65,716
INFORMATION DISSEMINATION 14,236
IO--277,053
ES--361,493
ENERGY FUELS AND WASTES CONTAINMENT AND TRANSPORT 164,916
ENVIRONMENTAL IMPACTS EVALUATION 181,239
PLANT / MINE OPERATIONAL SAFETY 67,837
POLLUTANT INTERACTIONS 11,128
SOLID WASTE MANAGEMENT AND LAND RECLAMATION 34,604
MONITORING 12,015
MEASUREMENTS TECHNOLOGY 15,886
WATER CONTROL AND PROTECTION 27,016
HEALTH PROTECTION, SAFETY, AND INDUSTRIAL HYGIENE 8,055
BER--286,481
HEALTH EFFECTS ASSESSMENTS 14,349
BIOLOGICAL EFFECTS IN EXPERIMENTAL SYSTEMS 58,539
EPIDEMIOLOGICAL STUDIES 8,383
ENVIRONMENTAL TRANSPORT / CONVERSION OF POLLUTANTS 39,446
CHARACTERIZATION AND ANALYSIS 32,357
ENVIRONMENTAL EFFECTS ASSESSMENTS 23,091
CLINICAL STUDIES IN HUMANS 16,330
ECOLOGICAL EFFECTS OF POLLUTANTS OR PHYSICAL DISTURBANCES 28,595

FIGURE 1. DISTRIBUTION OF FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING IN THOUSANDS OF DOLLARS BY RESEARCH CATEGORY FOR FISCAL YEAR 1980

Biological and Environmental R&D and Assessments (BER) were nearly equal, at 30 and 31% respectively, while 39% of the FY 1980 total was appropriated for Environmental and Safety Control Technology (ES). The largest single funding effort was in the area of environmental impacts evaluation within the IO category, which received more than 65% of funds earmarked for IO projects, or nearly 20% of the FY 1980 Inventory total. The biggest thrust in the ES category was in the area of containment and transport of energy fuels and wastes. Funding was the most diversified in the BER category, with the largest portion directed toward projects dealing with biological effects in experimental systems.

Table 3 shows the relationship of agency funding to these research categories. DOE's FY 1980 reported funds emphasized environmental and safety control technology, with more than 46% of its dollars designated for ES projects. Other agencies stressing the importance of ES research by earmarking high percentages of their reported funds for this category included the Department of Defense (DOD), National Aeronautics and Space Administration (NASA), the Nuclear Regulatory Commission (NRC), and the Department of Agriculture (DOA). Two thirds of all EPA funded projects fell into the BER category, which received 47% of its total energy budget. The Department of Health and Human Services (HHS) allocated 99% of its monies for BER research, with 509 out of 513 projects placed in this category. Agencies contributing the majority of their funds to projects concerned with technology impacts included HHS, the Department of Commerce (DOC), the National Science Foundation (NSF), and the Tennessee Valley Authority (TVA). Also heavily funded in this area were projects receiving partial or complete support from nonfederal organizations.

Table 4 provides further delineation of research category support by funding agency. Here, the projects reported are further classified by energy technology within research categories. It can be seen that DOE supported nuclear energy technology research in all R&D categories; however, more than half of its nuclear funds were budgeted for ES projects. In the area of fossil fuel research, DOE funding was equally spread between the ES and BER categories, with only slightly more than

TABLE 3. FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING BY RESEARCH CATEGORY FOR FISCAL YEAR 1980

Funding Agency	Environmental and Safety Control Technology ($1000's)	(projects)	Technology Impacts Overview and Assessment ($1000's)	(projects)	Biological and Environmental R&D ($1000's)	(projects)	Total ($1000's)	(projects)
Council on Environmental Quality	0	0	0	1	0	0	0	1
Department of Agriculture	460	85	0	29	0	71	460	185
Department of Commerce	0	0	7,323	6	2,274	13	9,597	19
Department of Defense	1,303	6	90	2	504	3	1,897	11
Department of Energy	236,528	118	126,042	158	150,472	722	513,042	998
Department of the Interior	26,403	84	44,171	92	9,819	56	80,393	232
Department of Transportation	1,070	13	2,181	31	2,805	7	6,056	51
Environmental Protection Agency	27,867	201	57,073	218	75,733	901	160,673	1,320
Other[a]	1,200	1	2,273	3	97	1	3,570	5
Department of Health and Human Services	0	0	210	4	31,470	509	31,680	513
Department of Housing and Urban Development	75	1	9,200	11	0	0	9,275	12
National Aeronautics and Space Administration	9,630	5	0	2	363	3	9,993	10
Nuclear Regulatory Commission	56,173	80	21,728	40	9,353	61	87,254	181
National Science Foundation	227	11	3,910	30	3,288	20	7,425	61
Office of Technology Assessment	0	0	53	2	0	0	53	2
Tennessee Valley Authority	557	11	2,799	40	303	9	3,659	60
Total	361,493	616	277,053	669	286,481	2,376	925,027	3,661[b]

[a]Partial or complete funding for various projects was provided by nonfederal organizations. These are grouped under the term "Other."

[b]The total number of projects is greater than the actual number of projects, 3603, since a project can have more than one funding agency.

TABLE 4. FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING BY ENERGY TECHNOLOGY WITHIN RESEARCH CATEGORIES FOR FISCAL YEAR 1980

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Council on Environmental Quality	Nuclear	0	1	IO[a]	0
	SUBTOTAL	0	1		0
Department of Agriculture	Fossil Fuels	1	55	ES	230
		0	15	IO	0
		0	35	BE	0
	Oil and Gas	0	3	BE	0
	Oil Shale	0	2	ES	0
		0	5	IO	0
	Nuclear	0	2	BE	0
	Geothermal	0	1	ES	0
	Solar	0	2	ES	0
		0	1	IO	0
	Direct Heat/Cool	0	1	IO	0
	Ocean, Wind	0	1	IO	0
	Biomass	0	18	ES	0
		0	6	IO	0
		0	2	BE	0
	Conservation	0	51	ES	0
		0	3	IO	0
		0	1	BE	0
	End Use	0	1	ES	0
		0	1	IO	0
	Reuse of Solid Waste	0	8	ES	0
		0	1	IO	0
		0	1	BE	0
	Multitechnology	0	6	ES	0
		0	4	IO	0
		0	24	BE	0

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of Agriculture (Continued)	General Science	0	10	BE	0
	Other	1	1	ES	230
	SUBTOTAL	2	261		460
Department of Commerce	Fossil Fuels	1	0	BE[b]	50
	Oil and Gas	3	0	IO	6,393
		2	0	BE	1,283
	Nuclear	2	0	BE	287
	Ocean, Wind	1	0	IO	450
	Conservation	1	0	IO	10
	Reuse of Solid Waste	0	1	BE	0
	Multitechnology	1	0	IO	460
		3	0	BE	508
	General Science	1	0	IO	10
		3	1	BE	146
	SUBTOTAL	18	2		9,597
Department of Defense	Fossil Fuels	1	0	ES[c]	175
		1	0	BE	235
	Oil and Gas	1	0	ES	185
		1	0	IO	40
	Multitechnology	2	0	ES	718
		1	0	IO	50
	General Science	1	0	BE	135
		1	0	ES	100
	Hydroelectric	1	0	BE	134
		1	0	ES	125
	SUBTOTAL	11	0		1,897

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of Energy	Fossil Fuels	56	1	ES	27,048
		22	3	IO	3,715
		190	3	BE	28,111
	Coal Conversion, Liquefaction	1	0	IO	300
		38	1	BE	6,520
	Coal Conversion, Gasification	12	0	ES	1,242
		5	0	IO	784
		34	3	BE	4,994
	Oil and Gas	5	0	ES	2,063
		6	0	IO	602
		26	2	BE	2,764
	Oil Shale	7	1	ES	334
		8	0	IO	929
		41	4	BE	8,239
	Biomass, Pyrolysis	1	0	IO	10
		2	0	BE	151
	Nuclear	27	2	ES	163,585
		14	1	IO	95,506
		125	1	BE	22,512
	Fission, Converters	5	0	IO	291
		109	0	BE	32,960
	Fission, Breeders	2	0	ES	35,425
		14	0	BE	2,478
	Fusion, Magnetic	5	0	ES	2,145
		2	0	IO	3,850
		17	0	BE	2,368
	Geothermal	1	0	ES	13
		8	0	IO	1,364
		18	0	BE	1,243
	Hydrothermal	1	0	IO	150
	Solar	3	0	IO	335
		19	0	BE	3,517
	Direct Heat/Cool	1	0	BE	200

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of Energy (Continued)	Electric	2	0	IO	85
		3	0	BE	612
	Ocean, Wind	4	0	IO	313
		3	0	BE	540
	Biomass	2	1	IO	26
		6	0	BE	619
	Conservation	6	0	ES	3,220
		8	0	IO	1,062
		33	0	BE	4,294
	End Use	1	1	IO	10
	Improved Conversion Efficiency	2	0	IO	975
		1	1	BE	50
	Energy Storage	3	0	BE	1,697
	Reuse of Solid Waste	7	0	ES	1,074
		2	0	IO	104
		3	0	BE	455
	Multitechnology	3	0	ES	200
		49	2	IO	11,804
		109	1	BE	19,414
	General Science	9	0	IO	2,609
		38	0	BE	4,783
	Medical Applications of Nuclear Technology	2	0	IO	417
		6	0	BE	738
	Hydroelectric	1	1	ES	145
		2	0	IO	658
		7	0	BE	1,216
	Other[d]	1	0	ES	34
		2	0	IO	145
	SUBTOTAL	1,140	29		513,042

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of the Interior	Fossil Fuels	54	2	ES	20,061
		10	2	IO	1,064
		16	1	BE	1,352
	Coal Conversion, Liquefaction	1	0	ES	2
		0	1	IO	0
		3	0	BE	32
	Coal Conversion, Gasification	2	0	ES	12
		0	2	IO	0
		3	0	BE	32
	Oil and Gas	2	0	ES	555
		49	7	IO	40,425
		11	9	BE	1,913
	Oil Shale	3	0	ES	1,303
		2	1	IO	333
		1	0	BE	218
	Biomass, Pyrolysis	1	0	ES	2
	Nuclear	3	1	ES	3,210
		1	1	IO	2
		2	0	BE	676
	Fission, Converters	1	0	BE	674
	Geothermal	2	0	ES	125
		2	0	IO	258
	Hydrothermal	1	0	ES	2
		1	0	IO	560
	Geopressurized	1	0	ES	2
	Solar	0	1	ES	0
		1	0	BE	32
	Conservation	3	1	IO	146
		1	0	BE	137
	End Use	3	1	IO	92
	Energy Storage	1	0	ES	43
	Multitechnology	12	0	ES	885

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of the Interior (Continued)		8	0	IO	309
		3	0	BE	140
	General Science	8	2	IO	978
		8	2	BE	4,574
	Medical Applications of Nuclear Technology	1	0	IO	2
		1	0	ES	43
	Hydroelectric	1	0	BE	40
		4	0	ES	161
	Other	1	1	IO	4
	SUBTOTAL	228	35		80,393
Department of Transportation	Fossil Fuels	1	0	ES	88
		3	0	IO	134
		1	1	BE	70
	Oil and Gas	0	1	ES	0
		3	1	IO	388
		0	1	BE	0
	Geothermal	2	0	IO	178
		0	1	BE	0
	Solar Electric	2	0	IO	229
		1	0	IO	29
	Ocean, Wind	4	4	ES	600
	Conservation	11	8	IO	599
		2	0	BE	262
	End Use	1	0	ES	55
		1	1	IO	60
		1	0	BE	70
	Improved Conversion Efficiency	1	0	ES	88
		3	0	IO	385
	Energy Storage	2	0	IO	178
	Reuse of Solid Waste	1	0	BE	104

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of Transportation (Continued)	Multitechnology	1	1	ES	240
		0	1	IO	0
	General Science	0	1	ES	0
		1	2	IO	4
		1	0	BE	2,300
	SUBTOTAL	43	23		6,056
Environmental Protection Agency	Fossil Fuels	51	17	ES	11,669
		56	18	IO	14,131
		207	104	BE	26,751
	Coal Conversion, Liquefaction	2	0	ES	115
		6	2	IO	218
		21	8	BE	1,767
	Coal Conversion, Gasification	1	0	ES	120
		10	3	IO	690
		28	13	BE	1,727
	Oil and Gas	18	4	ES	3,020
		14	3	IO	622
		79	33	BE	7,361
	Oil Shale	5	1	ES	205
		9	3	IO	30,912
		27	7	BE	1,957
	Biomass, Pyrolysis	1	1	IO	4
		2	2	BE	113
	Nuclear	2	0	ES	68
		6	3	IO	347
		9	5	BE	603
	Geothermal	0	1	ES	0
		3	1	IO	153
		3	1	BE	185
	Geopressurized	1	0	IO	30

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Environmental Protection Agency (Continued)	Solar	1	1	IO	74
		6	0	BE	522
	Electric	4	0	BE	211
	Ocean, Wind	1	0	BE	2
	Biomass	1	0	ES	44
		5	0	IO	356
		2	3	BE	8
	Conservation	0	5	ES	0
		4	3	IO	344
	End Use	2	3	BE	405
		1	0	ES	40
		0	3	IO	0
		0	2	BE	0
	Improved Conversion Efficiency	0	1	IO	0
	Reuse of Solid Waste	16	19	ES	1,502
		3	1	IO	79
		5	1	BE	179
	Multitechnology	32	19	ES	7,063
		43	11	IO	6,479
		136	76	BE	16,298
	General Science	19	5	ES	3,937
		28	4	IO	2,635
		141	46	BE	17,255
	Medical Applications of Nuclear Technology	5	0	BE	356
		2	2	BE	34
	Hydroelectric	1	0	ES	85
	Other				
	SUBTOTAL	1,019	435		160,673

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Other[e]	Fossil Fuels	2	0	IO	2,068
	Nuclear	1	0	ES	600
	Multitechnology	1	0	ES	600
	General Science	1	0	IO	205
	SUBTOTAL	6	0	BE	97
					3,570
Department of Health and Human Services	Fossil Fuels	105	41	BE	5,865
	Coal Conversion, Liquefaction	0	1	BE	0
	Coal Conversion, Gasification	1	1	BE	40
	Oil and Gas	69	38	BE	2,470
	Oil Shale	48	33	BE	1,285
	Nuclear	3	0	IO	95
	Geothermal	22	9	BE	861
	Solar	1	0	BE	20
	Biomass	11	6	BE	582
	Conservation	1	0	BE	14
	Multitechnology	1	1	BE	25
	General Science	7	6	BE	255
		1	0	IO	66
		161	88	BE	14,885
	Medical Applications of Nuclear Technology	1	0	IO	50
	Hydroelectric	49	32	BE	4,250
	Other	1	0	BE	69
	SUBTOTAL	18	0	BE	849
		500	256		31,680

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Department of Housing and Urban Development	Nuclear	1	0	ES	8
	Solar	3	1	IO	9,000
	Conservation	1	0	ES	68
		2	4	IO	200
	Reuse of Solid Waste	0	1	IO	0
	SUBTOTAL	7	6		9,275
National Aeronautics and Space Administration	Fossil Fuels	1	0	BE	37
	Oil and Gas	1	0	ES	116
		0	1	IO	0
	Multitechnology	0	1	IO	0
	General Science	5	0	ES	9,515
		1	1	BE	326
	SUBTOTAL	8	3		9,993
Nuclear Regulatory Commission	Nuclear	80	0	ES	56,173
		39	1	IO	21,720
		60	1	BE	9,199
	Fission, Converters	1	0	BE	66
	Fission, Breeders	1	0	BE	88
	End Use	1	0	IO	2
	Multitechnology	1	0	IO	2
	General Science	1	0	IO	2
	Medical Applications of Nuclear Technology	1	0	IO	2
	Other	0	1	IO	0
	SUBTOTAL	185	3		87,254

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
National Science Foundation	Fossil Fuels	1	1	ES	7
		4	1	IO	67
	Coal Conversion, Liquefaction	6	2	BE	2,019
	Coal Conversion, Gasification	0	1	BE	0
	Oil and Gas	0	1	BE	0
		0	1	ES	0
		4	0	IO	149
	Biomass, Pyrolysis	1	0	BE	10
		2	0	ES	109
	Nuclear	0	1	BE	0
		0	1	ES	0
		3	1	IO	177
	Fusion, Laser	2	0	BE	201
		1	0	ES	10
	Solar	1	0	IO	8
		2	0	IO	20
	Conservation	1	0	BE	700
	Energy Storage	0	1	BE	0
	Reuse of Solid Waste	1	0	IO	4
	Multitechnology	0	1	BE	0
		2	0	ES	79
		8	1	IO	3,015
	General Science	2	2	BE	125
		2	0	ES	22
		7	1	IO	315
	Other	3	2	BE	233
		1	1	IO	155
	SUBTOTAL	54	19		7,425

TABLE 4 (Continued)

Funding Agency	Energy Technology	Number of Projects With Funding	Number of Projects Without Funding	Research Category	Dollars ($1000's)
Office of Technology Assessment	Coal Conversion, Liquefaction	1	0	IO	32
	Oil Shale	1	0	IO	4
	Solar	1	0	IO	13
	Biomass	1	0	IO	4
	SUBTOTAL	4	0		53
Tennessee Valley Authority	Fossil Fuels	9	1	ES	557
		20	4	IO	2,068
		3	2	BE	153
	Biomass, Pyrolysis	1	0	IO	9
	Biomass	1	0	IO	166
	Conservation	1	0	IO	288
	Reuse of Solid Waste	0	1	ES	0
	Multitechnology	7	3	IO	191
		3	1	BE	150
	Hydroelectric	0	1	IO	0
	Other	4	0	IO	77
	SUBTOTAL	49	13		3,659
	TOTAL	3,274[f]	1,086[f]		925,027

[a]IO = Technology Impacts Overview and Assessment.

[b]BE = Biological and Environmental Research and Development and Assessment.

[c]ES = Environmental and Safety Control Technology Research and Development.

[d]The term "Other encompasses all projects which did not fit into the list of energy technologies provided in the questionnaire.

[e]Partial or complete funding for various projects was provided by nonfederal organizations. These are grouped under the term "Other."

[f]The total number of projects is greater than the actual number of projects since a project can have more than one funding agency and/or technology.

6% directed toward IO research. Other major research efforts included that of DOC and the Department of the Interior (DOI) in the area of oil and gas IO research, and of EPA in oil shale IO research. The NRC's reported nuclear dollars provided 64% of funds to projects dealing with environmental and safety control technology. The TVA indicated that 57% of their fossil energy monies went for technology impacts overview and assessment.

Table 5 and Figure 2 are complementary to Table 4 in forming a clear picture of the relationship of funding agencies to energy technologies. Table 5 and Figure 2 present an overview of agency support for all energy technologies described in the Federal Inventory questionnaire. It is evident from Figure 2 that a major portion of DOE's funds were expended for nuclear energy technology research. Table 5 data further substantiate this, by showing that 55% of the DOE funding was supportive of general nuclear research. Using Table 6 data (which provide a total FY 1980 figure for each technology) in combination with Table 5 totals, the percentage of technology support from each agency can be ascertained. DOE accounted for nearly 80% of the total reported support for all nuclear research. Other major support for nuclear research was contributed by NRC. Nearly all of NRC's total reported research budget was allocated to nuclear projects. In fossil fuel research, EPA, DOE, and DOI were the primary funding agencies. Of EPA's reported funds, one third supported general fossil fuel technology research. Of DOI's fossil energy technology funds, 64% was earmarked for oil and gas projects. Strong support for oil and gas research also came from DOC, which contributed 80% of its total reported research dollars for this technology. DOE's fossil fuel energy technology funds, which accounted for 17% of its reported energy-related research budget, actually represented about one third of the total FY 1980 reported fossil fuel research dollars. Although not a major contributor to the total fossil fuel energy research funds, TVA was an active supporter of this technology, devoting 76% of its reported dollars to this area of research.

TABLE 5. FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING BY ENERGY TECHNOLOGY FOR FISCAL YEAR 1980

Funding Agency	Energy Technology	Dollars ($1000's)
Council on Environmental Quality	Fossil Fuels	0
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	0
	General Science	0
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other[a]	0
	SUBTOTAL	0
Department of Agriculture	Fossil Fuels	230
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Department of Agriculture (Continued)	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	0
	General Science	0
	Medical Applications of Nuclear Technology	0
	Hydroelectric	230
	Other	460
	SUBTOTAL	
Department of Commerce	Fossil Fuels	50
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	7,676
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	287
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	450
	Ocean, Wind	0
	Biomass	10
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	968
	Multitechnology	

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Department of Commerce (Continued)	General Science	156
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	0
	SUBTOTAL	9,597
Department of Defense	Fossil Fuels	410
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	225
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	903
	Multitechnology	234
	General Science	0
	Medical Applications of Nuclear Technology	125
	Hydroelectric	0
	Other	1,897
	SUBTOTAL	
Department of Energy	Fossil Fuels	58,874
	Coal Conversion, Liquefaction	6,820
	Coal Conversion, Gasification	7,020
	Oil and Gas	5,429
	Oil Shale	9,502
	Biomass, Pyrolysis	161
	Nuclear	281,603
	Fission, Converters	33,250

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Department of Energy (Continued)	Fission, Breeders	37,903
	Fusion, Magnetic	8,363
	Fusion, Laser	0
	Geothermal	2,620
	Hydrothermal	150
	Geopressurized	0
	Hot Dry Rock	0
	Solar	3,852
	Direct Heat/Cool	200
	Electric	697
	Ocean, Wind	853
	Biomass	644
	Conservation	8,576
	End Use	10
	Improved Conversion Efficiency	1,025
	Energy Storage	1,697
	Reuse of Solid Waste	1,633
	Multitechnology	31,418
	General Science	7,392
	Medical Applications of Nuclear Technology	1,155
	Hydroelectric	2,019
	Other	179
	SUBTOTAL	513,042
Department of the Interior	Fossil Fuels	22,476
	Coal Conversion, Liquefaction	34
	Coal Conversion, Gasification	44
	Oil and Gas	42,893
	Oil Shale	1,854
	Biomass, Pyrolysis	2
	Nuclear	3,887
	Fission, Converters	674
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	383
	Hydrothermal	562
	Geopressurized	2
	Hot Dry Rock	0
	Solar	32
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	282
	End Use	92

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Department of the Interior (Continued)	Improved Conversion Efficiency	0
	Energy Storage	43
	Reuse of Solid Waste	0
	Multitechnology	1,334
	General Science	5,552
	Medical Applications of Nuclear Technology	2
	Hydroelectric	83
	Other	165
	SUBTOTAL	80,393
Department of Transportation	Fossil Fuels	291
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	388
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	178
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	229
	Ocean, Wind	29
	Biomass	0
	Conservation	1,461
	End Use	185
	Improved Conversion Efficiency	88
	Energy Storage	385
	Reuse of Solid Waste	282
	Multitechnology	240
	General Science	2,304
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	0
	SUBTOTAL	6,056
Environmental Protection Agency	Fossil Fuels	52,552
	Coal Conversion, Liquefaction	2,099
	Coal Conversion, Gasification	2,537
	Oil and Gas	11,002

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Environmental Protection Agency (Continued)	Oil Shale	33,074
	Biomass, Pyrolysis	117
	Nuclear	1,018
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	338
	Hydrothermal	0
	Geopressurized	30
	Hot Dry Rock	0
	Solar	596
	Direct Heat/Cool	0
	Electric	211
	Ocean, Wind	2
	Biomass	408
	Conservation	749
	End Use	40
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	1,759
	Multitechnology	29,839
	General Science	23,827
	Medical Applications of Nuclear Technology	356
	Hydroelectric	34
	Other	85
	SUBTOTAL	160,673
Other[a]	Fossil Fuels	2,068
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	600
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Other[a] (Continued)	Ocean, Wind	0
	Biomass	0
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	805
	General Science	97
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	0
	SUBTOTAL	3,570
Department of Health and Human Services	Fossil Fuels	5,865
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	40
	Oil and Gas	2,470
	Oil Shale	1,285
	Biomass, Pyrolysis	0
	Nuclear	956
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	20
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	582
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	14
	Conservation	25
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	255
	General Science	14,951
	Medical Applications of Nuclear Technology	4,299
	Hydroelectric	69
	Other	849
	SUBTOTAL	31,680

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Department of Housing and Urban Development	Fossil Fuels	0
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	8
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	9,000
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	268
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	0
	General Science	0
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	0
	SUBTOTAL	9,275
National Aeronautics and Space Administration	Fossil Fuels	37
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	116
	Oil Shale	0
	Biomass, Pyrolysis	0
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
National Aeronautics and Space Administration (Continued)	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	9,841
	General Science	0
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	9,993
	SUBTOTAL	
Nuclear Regulatory Commission	Fossil Fuels	0
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	0
	Biomass, Pyrolysis	87,092
	Nuclear	66
	Fission, Converters	88
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	2
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	2
	Multitechnology	2
	General Science	2
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	87,254
	SUBTOTAL	

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
National Science Foundation	Fossil Fuels	2,093
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	159
	Oil Shale	0
	Biomass, Pyrolysis	109
	Nuclear	378
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	18
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	720
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	0
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	4
	Reuse of Solid Waste	0
	Multitechnology	3,219
	General Science	570
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	155
	SUBTOTAL	7,425
Office of Technology Assessment	Fossil Fuels	0
	Coal Conversion, Liquefaction	32
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	4
	Biomass, Pyrolysis	0
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0

TABLE 5 (Continued)

Funding Agency	Energy Technology	Dollars ($1000's)
Office of Technology Assessment (Continued)	Hot Dry Rock	0
	Solar	13
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	0
	Biomass	4
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	0
	Multitechnology	0
	General Science	0
	Medical Applications of Nuclear Technology	0
	Hydroelectric	0
	Other	0
	SUBTOTAL	53
Tennessee Valley Authority	Fossil Fuels	2,778
	Coal Conversion, Liquefaction	0
	Coal Conversion, Gasification	0
	Oil and Gas	0
	Oil Shale	0
	Biomass, Pyrolysis	9
	Nuclear	0
	Fission, Converters	0
	Fission, Breeders	0
	Fusion, Magnetic	0
	Fusion, Laser	0
	Geothermal	0
	Hydrothermal	0
	Geopressurized	0
	Hot Dry Rock	0
	Solar	0
	Direct Heat/Cool	0
	Electric	0
	Ocean, Wind	166
	Biomass	288
	Conservation	0
	End Use	0
	Improved Conversion Efficiency	0
	Energy Storage	0
	Reuse of Solid Waste	341
	Multitechnology	0
	General Science	0
	Medical Applications of Nuclear Technology	0
	Hydroelectric	77
	Other	
	SUBTOTAL	3,659

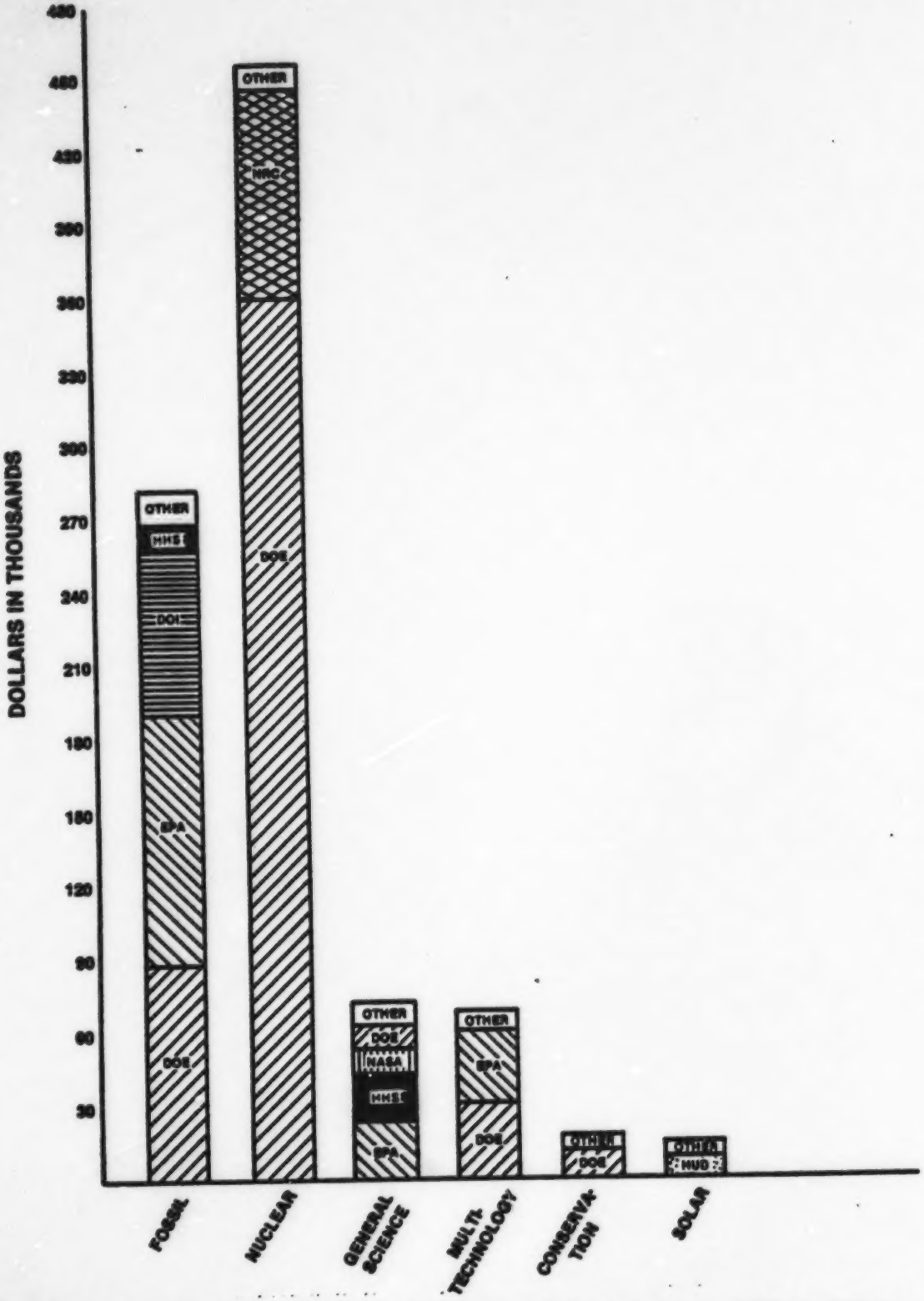

FIGURE 2. FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING BY ENERGY TECHNOLOGY FOR FISCAL YEAR 1980

TABLE 6. FEDERAL ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING ($1000's) BY ENERGY TECHNOLOGY WITHIN ENVIRONMENTAL ISSUES FOR FISCAL YEAR 1980

Energy Technology	Air Quality	Water Resources	Land disturbances	Ecology	Climate	Health	Safety	Societal Impacts	Multi-Issue	Total
Biomass	0	8	126	332	0	39	0	70	662	1,236
Biomass, Pyrolysis	241	2	0	109	0	23	0	0	23	397
Coal Conversion, Gasification	857	1,033	479	340	0	5,133	0	0	1,799	9,641
Coal Conversion, Liquefaction	409	105	0	419	0	7,039	0	0	1,013	8,995
Conservation	3,831	587	381	597	175	2,346	525	1,409	1,808	11,658
Direct Heat/Cool	0	0	0	0	0	200	0	0	0	200
Electric	0	0	0	0	0	721	70	15	331	1,137
End Use	125	90	0	0	0	0	0	110	4	329
Energy Storage	0	1,286	0	384	0	70	0	356	33	2,128
Fission, Breeders	184	0	0	75	0	1,624	36,108	0	0	37,991
Fission, Converters	138	1,290	111	2,805	61	28,548	947	0	90	33,990
Fossil Fuels	58,719	17,708	10,802	10,165	6,822	23,519	8,778	1,403	9,807	147,724
Fusion, Laser	0	10	0	0	0	0	0	0	8	18
Fusion, Magnetic	0	0	0	965	0	1,823	2,225	0	3,350	8,363
General Science	5,598	10,044	2,530	12,535	464	19,074	2,724	111	11,843	64,923
Geopressurized	0	2	0	0	0	0	0	0	30	32
Geothermal	857	332	1,083	440	0	20	0	184	624	3,539
Hydroelectric	0	656	0	1,605	0	69	0	0	0	2,330
Hydrothermal	0	2	560	0	0	0	0	0	150	712
Improved Conversion Efficiency	138	0	0	0	0	950	0	0	25	1,113
Medical Applications of Nuclear Technology	0	85	0	0	0	5,634	50	0	45	5,813
Multitechnology	11,520	12,926	5,010	8,406	185	13,548	529	900	16,302	69,323
Nuclear	3,364	4,171	4,796	4,102	160	33,216	297,250	127	28,643	375,829
Ocean, Wind	0	565	0	580	0	110	0	50	29	1,334
Oil and Gas	5,506	3,246	721	31,842	16	6,524	6,054	264	16,186	70,358
Oil Shale	349	2,590	1,086	1,217	16	4,532	0	6	35,924	45,718
Reuse of Solid Waste	79	200	2,305	25	0	347	104	178	437	3,674
Solar	152	1,361	0	2,131	2	1,357	0	9,060	733	14,795
Other[a]	0	67	400	80	5	849	0	0	339	1,740
Total	92,064	58,365	30,388	79,151	7,907	157,314	355,361	14,242	130,235	925,027

[a]The term "Other" encompasses all projects which did not fit into the list of energy technologies provided in the questionnaire.

In general science energy technology, major support for more basic research was received from HHS and NASA. Nearly half of HHS's reported funds and more than 98% of NASA's total reported support went to the general science category. EPA also funded general science projects, contributing more than one third of the total general science dollars. EPA, as well as DOE, supported projects classified as relating to all or nearly all the specified technologies. DOE was also a prime supporter of conservation projects. Nearly 84% of all conservation dollars was provided by DOE. The Department of Transportation (DOT) designated nearly one fourth of its reported dollars for conservation energy technology. In the area of solar research, the Department of Housing and Urban Development (HUD) designated 97% of its reported research dollars for solar projects. This accounted for nearly half of the total solar dollars.

Overall, the primary energy technology of concern reported to the FY 1980 Federal Inventory was nuclear technology, which received nearly half of the reported funding. The specific nuclear energy technology receiving major emphasis was fission. Nearly one third of the FY 1980 reported funds supported fossil energy technology projects, with both oil and gas and oil shale research being major concerns.

The Federal Inventory also focuses on the pollutants addressed by energy-related environmental, health, and safety research and development. Figure 3 shows the major pollutant categories and their respective funding. More than one third of the FY 1980 projects dealt with radionuclides. Also of major concern were organic compounds released during the energy cycle. Using a more specific pollutant listing, Table 7 illustrates the type of research addressing each pollutant concern and the funding support each received. In general, pollutant research was equally distributed among the three R&D categories, with both Technology Impacts Overview and Assessment and Biological and Environment R&D categories receiving 30 and 31% of the budget, respectively, and Environmental and Safety Control Technology receiving 39% of the FY 1980 Inventory dollars. Of all the research addressing the major pollutant concern, radionuclides, 57% was directed

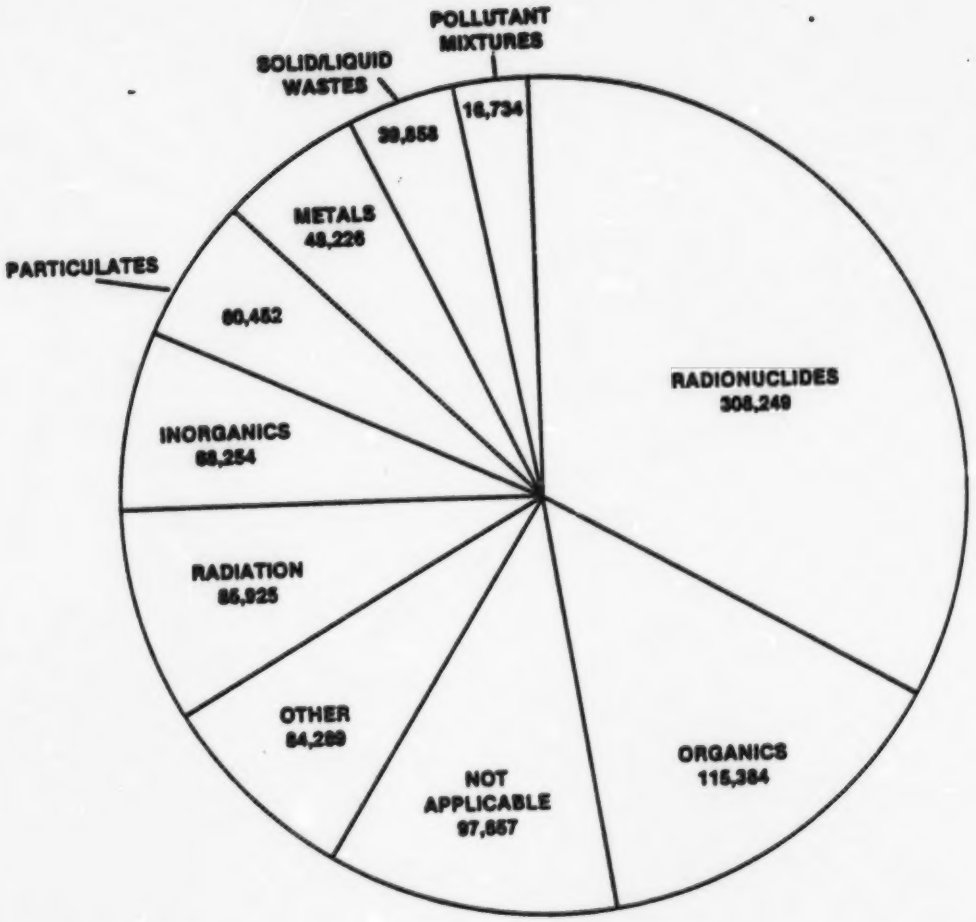

FIGURE 3. DISTRIBUTION OF FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING IN THOUSANDS OF DOLLARS BY POLLUTANT FOR FISCAL YEAR 1980

TABLE 7. FEDERAL ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING BY POLLUTANT WITHIN RESEARCH CATEGORIES FOR FISCAL YEAR 1980

Pollutant	Environmental and Safety Control Technology ($1000's)	Technology Impacts Overview/Assessment ($1000's)	Biological and Environmental R and D ($1000's)	Total ($1000's)
Acid Mine Drainage	0	0	174	174
Acid Rain	0	5	334	339
Asbestos	0	0	652	652
Carbon Oxides	5,425	2,562	10,489	18,476
Carcinogens	316	0	444	759
Complex Mixtures	12	565	3,236	3,813
Heat/Thermal	5,102	2,211	7,141	14,455
Hydrocarbons and Other Organics	10,578	31,703	54,628	96,909
Inorganic Compounds	130	23	1,694	1,847
Microorganisms	152	247	1,638	2,037
Mixtures of Defined Pollutants	4,762	1,918	6,240	12,921
Multiple Pollutants	624	34,797	9,697	45,118
Nitrogen Compounds	8,279	6,680	12,322	27,280
Noise/Vibration	2,632	779	1,256	4,668
Not Applicable	41,437	40,836	15,384	97,657
Nutrients	0	0	2,623	2,623
Odor	591	355	408	1,354
Particulates/Aerosols	20,940	15,107	24,405	60,452
Pesticides	0	11	528	539
Photochemical Oxidants	219	1,501	7,381	9,101
Radiation, Ionizing	37,675	8,581	33,337	79,593
Radiation, Nonionizing	0	690	5,642	6,332
Radionuclides	176,074	99,554	32,621	308,249
Salinity	36	72	367	475
Solid/Liquid Wastes	20,572	8,222	11,064	39,858
Sulfur Compounds	16,734	7,704	16,536	40,974
Trace and Heavy Metals	9,204	12,901	26,121	48,226
Visual Aesthetics	0	30	119	149
Total	361,493	277,053	286,481	925,027

toward ES-related projects. In contrast, research dealing with hydrocarbons and other organics received more than 56% of the funding support for BER projects. Many other pollutants received substantial funding in the BER category, including acid rain, asbestos, carbon oxides, complex mixtures, inorganic compounds, microorganisms, nutrients, photochemical oxidants, nonionizing radiation, salinity, trace and heavy metals, pesticides, and visual aesthetics.

Table 8 correlates pollutant funding with federal agency support. Again, it is not only possible to see the total support received by each pollutant category, but to trace, as well, agency concern for these pollutants as evidenced by their reported funding. In the area of radionuclide research, DOE provided the major support. Another primary DOE interest was in the area of ionizing radiation, which received 56% of its support from DOE funds. Another 38% was contributed by NRC. EPA was the only agency supporting projects dealing with carcinogens, pesticides, and visual aesthetics. In addition, EPA supported nearly all acid rain and inorganic compound research and contributed substantially to support for research addressing multiple pollutants, hydrocarbons and other organics, particulates/aerosols, solid/liquid wastes and residuals, sulfur compounds, and trace and heavy metals. Hydrocarbons and other organics were also of concern to DOI, which was the leading supporter of research in this area. DOE also was a substantial contributor to support for research dealing with trace and heavy metals. Other agencies which contributed a substantial portion of dollars to projects involved with hydrocarbons and organics were DOC, HHS, and NASA. Heat/thermal effects were supported by DOT, while all of the funding provided by DOA went for projects concerned with solid/liquid wastes and residuals.

In general, pollutant categories that were heavily funded, such as radionuclides, organics, radiation, inorganics, and particulates, received support from most funding agencies.

The media to which these pollutants relate, either through deposition, cycling, fate, and/or effects, are of interest to the Federal Inventory. Through Figure 4 it is possible to determine the primary environmental

TABLE 8. FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING ($1000's) BY POLLUTANT FOR FISCAL YEAR 1980

Pollutant	CEQ[a]	DOC	DOD	DOE	DOI	DOT	EPA	Other[b]	HHS	HUD	NASA	NRC	NSF	OTA	TVA	USDA	total
Acid Mine Drainage	0	0	0	0	143	0	31	0	0	0	0	0	0	0	0	0	174
Acid Rain	0	0	0	0	0	0	326	0	0	0	0	0	0	0	13	0	339
Asbestos	0	0	0	0	0	0	352	0	300	0	0	0	0	0	0	0	652
Carbon Oxides	0	50	92	13,051	113	294	2,139	0	299	0	2,145	13	353	4	33	0	18,476
Carcinogens	0	0	0	0	0	0	799	0	0	0	0	0	0	0	0	0	799
Complex Mixtures	0	0	0	3,189	488	0	137	0	76	0	0	27	0	4	0	0	3,813
Heat/Thermal	0	225	0	6,481	1,221	2,348	1,718	1,298	48	0	231	761	148	4	98	0	14,495
Hydrocarbons and Other Organics	0	2,361	277	22,894	29,533	273	25,253	0	13,777	0	2,145	28	1,135	4	27	0	98,908
Inorganic Compounds	0	0	0	169	0	0	1,563	0	0	0	0	0	0	0	115	0	1,847
Microorganisms	0	196	0	498	524	0	695	0	158	0	0	42	5	0	0	0	2,037
Mixtures of Defined Pollutants	0	143	168	5,116	3,088	199	2,894	0	576	0	493	27	3	4	78	0	12,991
Multiple Pollutants	0	928	135	1,884	645	0	39,998	0	637	0	0	0	1,981	0	78	0	45,119
Nitrogen Compounds	0	257	92	10,751	398	294	12,588	0	577	0	2,145	28	82	4	183	0	27,988
Noise/ Vibration	0	0	0	2,988	1,188	39	158	0	327	0	0	0	0	4	74	0	4,668
Not Applicable	0	388	349	19,284	6,857	2,248	1,543	382	2,595	9,298	326	49,946	3,763	0	938	0	97,859
Nutrients	0	0	0	1,523	0	0	1,188	0	0	0	0	0	0	0	0	0	2,873
Other	0	0	0	495	47	89	138	0	98	0	493	15	0	0	0	0	1,354
Particulates/ Aerosols	0	2,143	146	28,992	8,792	148	16,483	25	816	0	993	988	54	4	888	0	68,492
Pesticides	0	0	0	0	0	0	539	0	0	0	0	0	0	0	0	0	599
Photochemical Oxidants	0	0	0	4,291	73	48	3,789	0	871	0	0	13	32	4	0	0	9,101
Radiation, Ionizing	0	144	0	44,889	7	0	443	0	3,891	0	0	28,288	0	0	12	0	79,993
Radiation, Nonionizing	0	0	0	4,388	0	0	547	0	1,474	0	0	0	0	4	0	0	6,332
Radionuclides	0	144	0	281,288	1,581	0	489	0	144	75	0	4,323	238	0	4	0	288,299
Salinity	0	0	0	325	139	0	10	0	0	0	0	0	0	0	0	0	474
Solid/Liquid Wastes and Residuals	0	143	550	11,577	8,329	4	17,794	0	148	0	0	489	42	4	329	488	39,888
Sulfur Compounds	0	94	88	14,988	3,635	146	18,874	2,843	839	0	530	28	57	4	748	0	48,978
Trace and Heavy Metals	0	2,421	0	15,475	13,285	87	11,724	0	4,329	0	493	341	38	4	57	0	48,228
Visual Aesthetics	0	0	0	0	0	0	149	0	0	0	0	0	0	0	0	0	149
total	0	9,997	18,975	13,042	88,383	88,581	88,673	3,578	31,888	9,275	9,993	87,254	7,425	53	3,899	488	525,827

[a]Source for agency abbreviations are found in Appendix C.

[b]Partial or complete funding for various projects was provided by nonfederal organizations. These are grouped under the term "other."

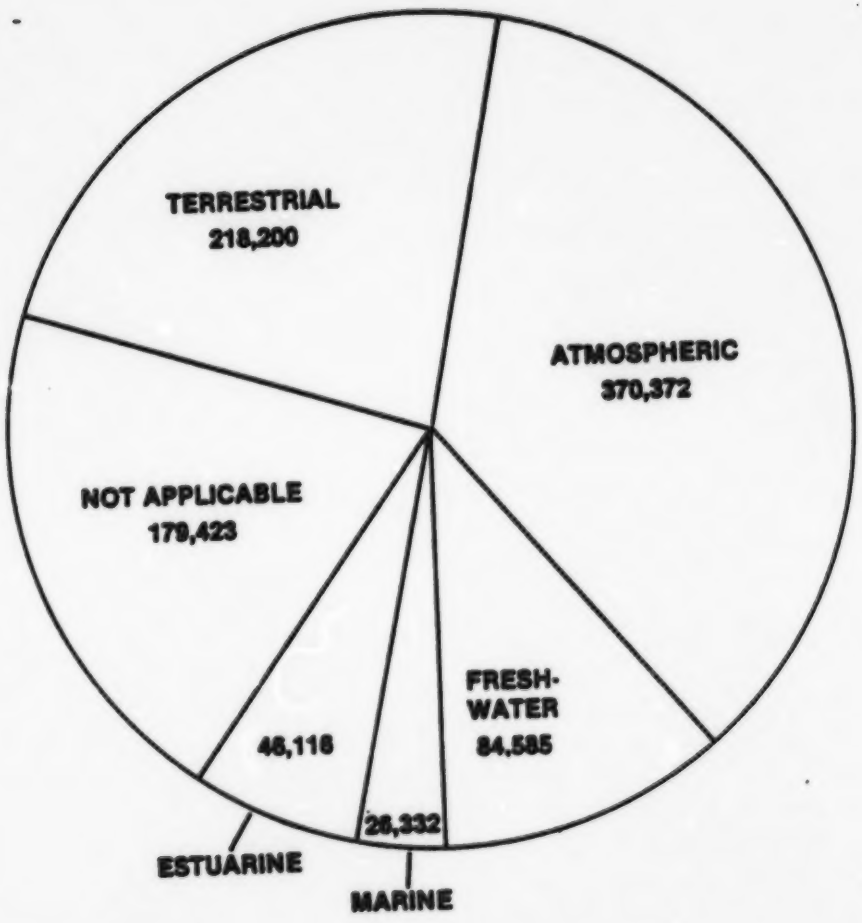

FIGURE 4. DISTRIBUTION OF FEDERAL AGENCY ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT FUNDING IN THOUSANDS OF DOLLARS BY MEDIA FOR FISCAL YEAR 1980

concerns of energy-related environmental, health, and safety research and development during FY 1980. Because nearly 40% of the reported funds supported projects concerned with atmospheric effects, this proved to be the major environmental effort. Five federal agencies, including DOE, EPA, HHS, NASA, and TVA, stressed atmospheric funding. A great deal of effort also went into the terrestrial program, which received nearly one fourth of the FY 1980 dollars. Of the aquatic ecosystems, research concerned with effects on the freshwater habitat received most support, with marine-related programs receiving the least.

Energy-related research program support is further classified by media according to agency funding, as seen in Table 9. Although supportive of energy-related research and development in all environmental media, the main emphasis of DOE was in the atmospheric area. During FY 1980, 68% of DOE's reported funds supported projects addressing the atmosphere. DOE also contributed substantially to terrestrial studies, supporting 84% of terrestrial-related research. Although EPA allocated more dollars for atmospheric and terrestrial research, they were the leading contributor of both freshwater and estuarine support. As the contributor of 40% of the total program budget, DOI was the leading agency in the area of marine research.

An understanding of the environmental issues addressed by energy-related environmental, health, and safety research and development is one of the goals of the Federal Inventory. Tables 6 and 10 show data relating to the areas of environmental concern. Table 6 presents the issues as related to the various energy technologies, while Table 10 includes the role of the funding agency in supporting research addressing these issues within the various technologies. Table 6 also serves as an excellent reference for a total funding breakdown for each major energy technology category.

Although substantial dollars were allotted for multi-issue projects, the single environmental issue of greatest concern was that of safety. Projects dealing with the safety issue accounted for more than 38% of the FY 1980 Inventory dollars. Also of considerable concern was the

TABLE 9. FEDERAL AGENCY FUNDING ($1000's) OF ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT BY MEDIA FOR FISCAL YEAR 1980

Funding Agency	Atmospheric	Terrestrial	Freshwater	Estuarine	Marine	Not Applicable	Total
Council on Environmental Quality	0	0	0	0	0	0	0
Department of Agriculture	0	153	153	0	153	0	460
Department of Commerce	501	96	326	0	3,936	4,740	9,597
Department of Defense	645	0	235	0	84	933	1,897
Department of Energy	252,417	182,405	24,717	14,468	5,080	33,954	513,042
Department of the Interior	4,200	4,457	10,663	9,960	10,640	40,472	80,393
Department of Transportation	1,218	32	48	48	8	4,704	6,056
Environmental Protection Agency	61,509	25,741	38,477	20,647	5,299	9,000	160,673
Other[a]	2,668	0	600	0	0	302	3,570
Department of Health and Human Services	13,477	1,933	2,740	8	296	13,226	31,680
Department of Housing and Urban Development	75	0	0	0	0	9,200	9,275
National Aeronautics and Space Administration	9,552	0	0	0	0	442	9,993
Nuclear Regulatory Commission	21,182	2,718	6,197	806	331	56,021	87,254
National Science Foundation	1,309	135	24	24	505	5,430	7,425
Office of Technology Assessment	17	17	10	10	0	0	53
Tennessee Valley Authority	1,604	513	395	147	0	1,000	3,659
Total	370,372	218,200	84,585	46,116	26,332	179,423	925,027

TABLE 30. FEDERAL AGENCY FUNDING ($1,000's) OF ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT BY ENERGY TECHNOLOGY WITHIN ENVIRONMENTAL ISSUES FOR FISCAL YEAR 1980

Funding Agency	Energy Technology	Air Quality	Water Resources	Land Disturbances	Ecology	Climate	Health	Safety	Societal Impacts	Multi-Issue	Total
Council on Environmental Quality	Nuclear										
	SUBTOTAL										
Department of Agriculture	Biomass										
	Conservation										
	Direct Heat/Coal										
	End Use			230							230
	Fossil Fuels										
	General Science										
	Geothermal										
	Multitechnology										
	Nuclear										
	Ocean, Wind										
	Oil and Gas										
	Oil Shale										
	Reuse of Solid Waste										
	Solar			230							230
	Other			400							400
	SUBTOTAL										
Department of Commerce	Conservation		30		30		50	107	50		267
	Fossil Fuels		10		330			257			597
	General Science										688
	Multitechnology							265	25		7,475
	Nuclear		450		6,340						
	Ocean, Wind		1,000								
	Oil and Gas										
	Reuse of Solid Waste										
	SUBTOTAL	0	1,470	0	6,705	50	107	570	75	650	9,947
Department of Defense	Fossil Fuels	410								174	410
	General Science	100			125			40		125	234
	Hydroelectric		368	958	50						125
	Multitechnology		105					40		209	1,997
	Oil and Gas				175						
	SUBTOTAL	510	353	958	332		25	40		708	661
Department of Energy	Biomass	120		82			23			10	161
	Biomass, Pyrolysis						4,106			1,630	7,879
	Coal Conversion, Gasification	64	722	479			9,535				8,880
	Coal Conversion, Liquefaction	75				175	2,223	312		811	9,570
	Conservation	3,367	436	381	458		200	70	70	702	298
	Direct Heat/Coal						530			25	897
	Electric										30
	End Use		20				70				1,097
	Energy Storage		1,200	75	341		1,624	30,300			37,303
	Fission, Breeders	95					38,540	947			33,230
	Fission, Converters	72	817	111	2,005		8,751		2,000	2,000	50,024
	Fossil Fuels	23,307	502	9,035	1,330	6,030	12,154	2,225	3,330	50	8,363
	Fusion, Magnetic				365	51	1,023	263	2,470	2,470	7,302
	General Science	1,353	1,137	235	412		1,430		665	665	2,820
	Geothermal	857	110	812	95					730	2,820
	Hydroelectric		888		1,411						150
	Hydrothermal									25	1,075
	Improved Conversion Efficiency	50					590			41	1,155
	Medical Applications of Nuclear Technology						1,114				

TABLE 30 (Continued)

Funding Agency	Energy Technology	Air Quality	Water Resources	Land Disturbances	Ecology	Climate	Health	Safety	Societal Impacts	Multi-issue	Total
Department of Energy (Continued)	Multitechnology	3,052	1,150	200	5,942	383	7,200	87	411	11,700	30,410
	Nuclear	1,349	574	2,100	3,167	160	27,723	244,347	0	1,705	280,603
	Ocean, Wind	0	113	0	500	0	110	0	50	0	853
	Oil and Gas	1,734	443	729	1,140	0	1,240	22	0	16	5,429
	Oil and Shale	257	501	743	310	0	2,017	0	0	4,888	9,302
	Reuse of Solid Waste	0	0	1,170	0	0	230	0	0	225	1,633
	Solar	70	1,329	0	1,921	2	463	0	68	0	3,852
	Other[a]	0	34	0	0	5	0	0	0	140	179
	SUBTOTAL	36,488	10,946	12,648	22,447	7,322	100,904	290,129	1,521	31,721	513,042
Department of the Interior	Biomass, Pyrolysis	0	2	0	0	0	0	0	0	0	2
	Coal Conversion, Gasification	0	12	0	0	0	7	0	0	75	44
	Coal Conversion, Liquefaction	0	2	0	0	0	7	0	0	75	34
	Conservation	0	143	0	130	0	0	0	0	0	702
	End Use	0	68	0	0	0	0	0	50	2	120
	Energy Storage	0	0	0	43	0	0	0	0	0	43
	Fission, Converters	0	674	0	0	0	0	0	0	0	674
	Fossil Fuels	244	13,771	2,277	201	0	1,463	2,953	47	1,521	22,476
	General Science	0	936	4	3,453	0	0	0	57	1,882	9,542
	Unprocessed	0	2	0	0	0	0	0	0	0	2
	Geothermal	0	187	248	10	0	0	0	0	70	383
	Hydroelectric	0	63	0	43	0	0	0	0	0	83
	Hydrothermal	0	2	580	0	0	0	0	0	0	582
	Medical Applications of Nuclear Technology	0	0	0	0	0	0	0	0	2	2
	Multitechnology	0	288	483	103	0	186	292	68	225	1,334
	Nuclear	0	670	0	2	0	0	0	0	3,208	3,887
	Oil and Gas	20	0	0	21,867	0	0	3,200	182	15,575	42,833
	Oil Shale	0	1,142	230	210	0	0	0	0	270	1,854
	Solar	0	32	0	0	0	0	0	0	0	32
	Other	0	0	85	0	0	0	0	0	0	165
	SUBTOTAL	264	17,762	3,793	25,884	0	1,663	8,304	406	22,350	80,393
Department of Transportation	Conservation	458	0	0	0	0	0	216	291	588	1,461
	Electric	0	0	0	0	0	0	0	0	229	229
	End Use	125	0	0	0	0	0	0	358	0	185
	Energy Storage	0	0	0	0	0	0	0	0	119	119
	Fossil Fuels	88	0	0	0	0	0	0	88	0	176
	General Science	0	0	0	0	0	0	2,200	4	0	7,305
	Geothermal	0	0	0	0	0	0	0	170	0	170
	Improved Conversion Efficiency	0	0	0	0	0	0	0	0	0	0
	Multitechnology	88	0	0	0	0	0	240	0	0	240
	Ocean, Wind	0	0	0	0	0	0	0	0	29	29
	Oil and Gas	0	0	0	0	0	0	0	0	0	0
	Reuse of Solid Waste	0	0	0	0	0	0	180	0	0	180
	Solar	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	750	0	0	0	0	0	3,296	1,150	990	6,956
Environmental Protection Agency	Biomass	0	0	0	0	0	0	0	70	296	488
	Biomass, Pyrolysis	113	0	0	0	0	0	0	0	4	117
	Coal Conversion, Gasification	773	300	0	340	0	981	0	0	144	2,537
	Coal Conversion, Liquefaction	334	103	0	419	0	1,897	0	0	146	7,899
	Conversion	74	0	0	0	0	30	0	0	0	749
	Electric	0	0	0	0	0	211	0	0	0	711
	End Use	0	68	0	0	0	0	0	0	0	68
	Fossil Fuels	31,290	3,231	2,242	6,972	29	6,483	0	568	3,745	52,952
	General Science	644	1,941	1,534	8,478	116	1,819	0	0	1,189	21,917

TABLE 10 (Continued)

Funding Agency	Energy Technology	Air Quality	Water Resources	Land Disturbances	Ecology	Climate	Health	Safety	Societal Impacts	Multi-Issue	Total
Environmental Protection Agency (Continued)	Unquantified	0	0	0	0	0	0	0	0	30	30
	Geothermal	0	115	31	167	0	0	0	0	0	313
	Hydroelectric	0	0	0	26	0	0	0	0	0	34
	Improved Conversion Efficiency	0	0	0	0	0	0	0	0	0	0
	Medical Applications of Nuclear Technology	0	85	0	0	0	271	0	0	0	356
	Multitechnology	7,635	9,727	3,025	1,972	2	5,047	112	234	629	29,039
	Nuclear	0	356	38	0	0	311	0	0	304	1,098
	Ocean, Wind	0	2	0	0	0	0	0	0	0	2
	Oil and Gas	3,681	1,838	0	2,829	16	2,862	0	0	176	11,402
	Oil and Shale	112	867	125	648	15	465	0	0	30,830	33,070
	Reuse of Solid Waste	79	268	1,127	25	0	117	0	0	212	1,750
	Solar	74	0	0	218	0	332	0	0	0	696
	Other	0	0	85	0	0	0	0	0	0	85
	SUBTOTAL	44,775	20,640	10,021	21,908	179	19,705	112	925	30,209	168,673
Other[b]	Fossil Fuels	2,068	0	0	0	0	0	0	0	0	2,068
	General Science	0	0	0	0	0	0	0	0	97	97
	Multitechnology	205	800	0	0	0	0	0	0	0	805
	Nuclear	0	600	0	0	0	0	0	0	0	600
	SUBTOTAL	2,273	1,200	0	0	0	0	0	0	97	3,570
Department of Health and Human Services	Biomass	0	0	0	0	0	14	0	0	0	14
	Coal Conversion, Gasification	0	0	0	0	0	40	0	0	0	40
	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	0	0
	Conservation	0	0	0	0	0	25	0	0	0	25
	Fossil Fuels	0	0	0	427	0	5,439	0	0	0	5,865
	General Science	0	0	0	125	0	14,518	0	308	308	14,951
	Geothermal	0	0	0	0	0	20	0	0	0	20
	Hydroelectric	0	0	0	0	0	69	0	0	0	69
	Medical Applications of Nuclear Technology	0	0	0	0	0	4,250	0	0	0	4,250
	Multitechnology	0	0	0	0	0	235	0	0	0	235
	Nuclear	0	0	0	28	0	1,883	30	0	0	1,941
	Oil and Gas	0	0	0	156	0	2,314	0	0	0	2,470
	Oil Shale	0	0	0	35	0	1,250	0	0	0	1,285
	Solar	0	0	0	0	0	582	0	0	0	582
	Other	0	0	0	0	0	849	0	0	0	849
	SUBTOTAL	0	0	0	780	0	30,493	99	0	308	31,680
Department of Housing and Urban Development	Conservation	0	0	0	0	0	68	0	700	0	768
	Nuclear	0	0	0	0	0	0	0	0	0	0
	Reuse of Solid Waste	0	0	0	0	0	0	0	9,000	0	9,000
	Solar	0	0	0	0	0	75	0	9,200	0	9,275
	SUBTOTAL	0	0	0	0	0	75	0	9,200	0	37
National Aeronautics and and Space Administration	Fossil Fuels	0	0	0	37	0	0	0	0	0	37
	General Science	3,458	0	0	0	0	0	136	0	6,267	9,861
	Multitechnology	0	0	0	0	0	0	0	0	0	0
	Oil and Gas	0	0	0	0	0	0	136	0	0	196
	SUBTOTAL	3,458	0	0	37	0	0	231	0	6,267	9,993
Nuclear Regulatory Commission	End Use	0	0	0	0	0	0	0	0	2	2
	Fission, Breeders	88	0	0	0	0	0	0	0	0	88
	Fission, Converters	66	0	0	0	0	0	0	0	2	2
	General Science	0	0	0	0	0	0	0	0	0	0

Funding Agency	Energy Technology	Air Quality	Water Resources	Land Disturbances	Ecology	Climate	Health	Safety	Societal Impacts	Multi-issue	Total
Nuclear Regulatory Commission (Continued)	Medical Applications of Nuclear Technology	0	0	0	0	0	0	0	0	2	2
	Multitechnology	0	0	0	0	0	0	0	0	2	2
	Nuclear	2,015	1,522	2,678	695	0	3,936	52,775	0	23,471	87,092
	SUBTOTAL	2,169	1,522	2,678	695	0	3,936	52,775	0	23,479	87,254
National Science Foundation	Biomass, Pyrolysis	0	0	0	109	0	0	0	0	0	109
	Coal Conversion, Gasification	0	0	0	0	0	0	0	0	0	0
National Science Foundation (Continued)	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	0	0
	Conservation	0	0	0	0	0	0	0	0	4	4
	Energy Storage	0	0	0	0	0	0	0	0	0	0
	Fossil Fuels	0	0	0	1,151	106	0	7	9	821	2,093
	Fusion, Laser	0	10	0	0	0	0	0	0	0	10
	General Science	17	0	2	29	250	0	46	50	175	570
	Multitechnology	0	37	18	0	0	0	0	206	2,958	3,219
	Nuclear	0	0	0	201	0	50	0	127	0	378
	Oil and Gas	101	0	2	10	0	0	0	20	19	150
	Reuse of Solid Waste	0	0	0	0	0	0	0	0	0	0
	Solar	0	0	0	0	0	0	0	0	720	720
	Other	0	0	0	0	0	0	0	0	155	155
	SUBTOTAL	118	47	22	1,500	356	50	53	470	4,859	7,475
Office of Technology Assessment	Biomass	0	0	0	0	0	0	0	0	4	4
	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	32	32
	Oil Shale	0	0	0	0	0	0	0	0	4	4
	Solar	0	0	0	0	0	0	0	0	13	13
	SUBTOTAL	0	0	0	0	0	0	0	0	53	53
										106	106
Tennessee Valley Authority	Biomass	0	0	0	0	0	0	0	0	9	9
	Biomass, Pyrolysis	0	0	0	0	0	0	0	280	0	280
	Conservation	0	0	0	0	0	0	62	298	743	2,778
	Fossil Fuels	1,313	114	218	40	0	0	0	0	0	0
	Hydroelectric	0	0	0	0	0	0	0	0	13	341
	Multitechnology	28	278	0	22	0	0	0	0	0	0
	Reuse of Solid Waste	0	0	0	0	0	0	0	0	44	77
	Other	0	33	0	0	0	0	0	0	0	0
	SUBTOTAL	1,341	425	218	62	0	0	62	576	975	3,659
	TOTAL	92,064	58,365	30,388	79,151	7,907	156,994	355,681	14,242	925,827	

[a]The term "Other" encompasses all projects which did not fit into the list of energy technologies in the questionnaire.

[b]Partial or complete funding for various projects was provided by nonfederal organizations. These are grouped under the term "Other."

health issue, which received 17% of the funds. Within energy technologies, health was the issue of most concern for 10 out of the 29 technologies. Those projects dealing with general fossil-fuel technology showed the greatest concern for air quality. This was also the concern of biomass-pyrolysis. However, in more specific relationships, the issue of greatest concern to coal conversion and oil shale technologies was health, while oil and gas technologies considered ecology the prime issue. Ecology was also the major concern of hydroelectric and ocean/wind research.

Within nuclear energy technologies those programs described as general were overwhelmingly concerned with safety. This is demonstrated by the fact that nearly 80% of the general nuclear technology dollars supported research dealing with safety. Likewise, 95% of the dollars for fission breeder programs was designated for safety-related research. In comparison, 84% of research in the fission converter program addressed the issue of health. The issue of societal impacts was of most interest to solar-related projects. Climate was the issue of least concern to energy-related environmental, health, and safety research.

By incorporating the role of the funding agency into the relationship between environmental issues and energy technologies as seen in Table 10, it becomes possible to describe each agency's environmental concern as associated with the various energy technologies.

For DOC as well as DOI, the greatest emphasis was funding oil and gas projects concerned with the ecology. Safety was an issue of great concern to several funding agencies. For both DOE and NRC, nuclear safety was the major research effort. Safety was also the issue of greatest concern to DOT, although nearly all their funded projects addressing safety problems were in the general science category.

As expected, health was the issue of greatest concern to HHS, with most of the projects addressing this issue described as basic research in the general science category. Although for most agencies the issue of societal impacts did not receive major funding, it was the prime concern

of HUD. More than 99% of the reported HUD funds supported research concerned with societal impacts, with 98% of this total going to solar projects. For EPA, air quality as related to the use of fossil fuel was the issue receiving major support. EPA contributed support for nearly half of the research concerned with the issue of air quality. This interest in air quality as related to fossil fuel was also shared by TVA. TVA designated 76% of its reported funds for research in this area.

For some agencies, most funding was directed into projects that are classified as multi-issue. NASA, NSF, and the Office of Technology Assessment (OTA) were prime supporters of multi-issue projects. NSF was more supportive of multi-technology projects that are multi-issue, while NASA's dollars were directed toward projects of a more basic nature under the general science category. All the projects supported by OTA were described as multi-issue.

Table 10 also identifies agency responsibility for support of an issue as addressed by a specific energy technology. For example, the major support for research addressing the effect on water resources created by the development of geothermal energy technologies came from DOE, DOI, and EPA.

As research is classified according to energy technology, it is useful and desirable to further describe it as to the stage of the energy research cycle to which the project relates. Table 11 summarizes these data and can be used to identify the sources of major support for a particular energy research cycle and energy technology. The single greatest funding effort was that by DOE for programs in nuclear waste management. DOE directed 46% of its reported dollars into this research area. In the area of fossil fuel research, DOE contributed 45% of that budget toward projects within the combustion/ utilization cycle. Fossil fuel combustion/utilization research was also a main concern of EPA. EPA's emphasis in funding was in oil shale and general fossil fuel research within the combustion/utilization energy cycle. Other agencies exhibiting a strong interest in this area were HHS, NSF, and OTA. While

TABLE 11. FEDERAL AGENCY FUNDING ($1,000's) OF ENVIRONMENT, HEALTH, AND SAFETY RESEARCH AND DEVELOPMENT BY ENERGY TECHNOLOGY WITHIN ENERGY RESEARCH CYCLES FOR FISCAL YEAR 1980

Funding Agency	Energy Technology	Exploration	Extraction	Secondary Recovery	Tertiary Recovery Combustion In Situ Conversion In Situ	Transportation Transmission	Storage	Processing	Conversion	Combustion Utilization	Waste Management	Decontamination Decommissioning	Not Applicable	Total
Council on Environmental Quality[a]	Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0
Department of Commerce	Conservation									50			50	50
	Fossil Fuels												117	117
	General Science									778			150	928
	Multitechnology					257								257
	Nuclear									450				450
	Ocean, Wind									283			6,308	7,591
	Oil and Gas	1,000	45							0			0	0
	Reuse of Solid Waste	0	0											
	SUBTOTAL	1,000	45	0	0	266	0	0	0	1,561	0	0	6,625	9,997
Department of Agriculture	Biomass													
	Conservation													
	Direct Heat/Coal													
	End Use													230
	Fossil Fuels		230											
	General Science													
	Geothermal													
	Multitechnology													
	Nuclear													
	Ocean, Wind													
	Oil and Gas													
	Oil Shale													
	Reuse of Solid Waste													230
	Solar													
	Other		230											460
	SUBTOTAL	0	460	0	0	0	0	0	0	235	175	0	134	430
Department of Defense	Fossil Fuels									188				188
	General Science								125				125	250
	Hydroelectric												983	983
	Multitechnology									0	185		88	273
	Oil and Gas								125	338	360	0	1,077	1,897
	SUBTOTAL	0	0	0	0	0	0	0	250	526	545	0	1,296	2,617
Department of Energy	Biomass			180		26	272		25	0			42	544
	Biomass, Pyrolysis								10	151				161
	Coal Conversion, Gasification					70		30	5,975	840	26	31	48	7,020
	Coal Conversion, Liquefaction							1,000	5,439	382				5,820
	Conservation		162	553		1,040	657	329	190	4,551	222		75	8,579
	Direct Heat/Coal								200					200
	Electric		577			35			85				30	727
	End Use													30
	Energy Storage					70	1,027							1,097
	Fission, Breeders							346		37,402	73			37,821
	Fission, Converters		1,099			2,215		590	139	25,500	2,349	346	813	33,250
	Fossil Fuels		9,964	70		450	311	3,000	14,066	26,324	201	0	2,704	50,071
	Fusion, Magnetic	0	0	0	0	130	0	0	343	6,522	200	1,100	0	8,765

TABLE II (Continued)

Funding Agency	Energy Technology	Exploration	Extraction	Secondary Recovery	Tertiary Recovery Combustion In Situ Conversion In Situ	Transportation Transmission	Storage	Processing	Conversion	Combustion Utilization	Waste Management	Decontamination Decommissioning	Yet Applicable	Total
Department of Energy (Continued)	General Science	30	123			30	77	341	0	2,838	0	0	3,363	7,302
	Geothermal	0	63	0	0	650	237	13	233	1,859	36	0	256	2,629
	Hydroelectric	0	0	0	0	0	0	0	0	0	0	0	1,124	7,019
	Hydrothermal	0	0	0	0	0	0	0	0	0	0	0	150	150
	Improved Conversion Efficiency	0	0	0	0	0	0	0	0	1,825	0	0	0	1,825
	Medical Applications of Nuclear Technology	0	48	0	0	0	0	0	0	1,057	0	0	50	1,155
	Multitechnology	427	481	383	0	1,183	0	1,885	897	21,245	836	0	4,021	31,478
	Nuclear	185	175	0	0	413	0	305	230	19,872	239,925	10,000	851	281,083
	Ocean, Wind	110	0	688	0	0	0	0	30	538	0	0	175	853
	Oil and Gas	122	1,251	425	219	705	0	31	180	2,470	0	0	99	5,429
	Oil Shale	0	5,151	0	0	0	0	1,023	856	204	670	31	672	9,582
	Reuse of Solid Waste	188	0	485	0	0	0	0	70	888	174	0	86	1,633
	Solar	0	0	0	0	0	0	0	0	2,317	0	0	1,270	3,852
	Other	0	0	0	0	140	0	0	0	0	0	0	39	179
	SUBTOTAL	1,030	19,991	2,415	219	7,046	3,290	30,956	29,557	156,702	245,129	20,117	98,829	613,682
Department of the Interior	Biomass, Pyrolysis	0	0	0	0	0	0	2	0	0	0	0	0	2
	Coal Conversion, Gasification	25	0	0	0	0	0	2	17	0	0	0	0	44
	Coal Conversion, Liquefaction	25	0	0	0	0	0	2	7	0	0	0	28	34
	Conservation	139	0	62	0	0	0	0	61	0	0	0	58	262
	End Use	0	0	0	0	0	0	0	0	0	0	0	0	92
	Energy Storage	0	0	0	0	0	0	0	0	0	0	0	0	63
	Fission, Converters	0	0	0	0	0	0	0	0	0	674	0	0	674
	Fossil Fuels	611	20,749	0	0	126	0	486	0	154	0	0	298	22,424
	General Science	822	2,048	0	0	268	0	0	0	0	588	0	230	3,952
	Geopressurized	0	0	0	0	0	0	0	0	0	0	0	2	2
	Geothermal	250	0	0	0	0	63	0	0	187	0	0	83	383
	Hydroelectric	300	0	0	0	0	0	0	0	0	0	0	2	83
	Hydrothermal	0	0	0	0	0	0	0	0	0	0	0	0	562
	Medical Applications of Nuclear Technology	0	0	0	0	0	0	0	0	0	0	0	0	2
	Multitechnology	73	1,112	0	0	0	0	0	0	0	22	0	126	1,334
	Nuclear	17,907	2,245	0	2,396	258	0	0	0	0	3,000	0	2	3,000
	Oil and Gas	0	1,515	0	0	0	0	0	0	588	0	0	19,000	42,993
	Oil Shale	0	0	0	0	0	0	0	0	0	0	0	333	1,004
	Solar	0	0	0	0	0	0	0	0	32	0	0	0	32
	Other	84	76	0	0	0	0	0	0	0	0	0	0	105
	SUBTOTAL	20,183	20,443	67	2,396	636	85	491	70	795	5,481	0	21,020	80,393
Department of Transportation	Conservation	0	0	0	0	421	0	0	223	646	0	0	366	1,461
	Electric	0	0	0	0	0	0	0	0	0	0	0	0	223
	End Use	0	0	0	0	0	0	0	29	185	0	0	330	185
	Energy Storage	16	0	0	0	0	0	0	0	0	0	0	0	365
	Fossil Fuels	0	0	0	0	0	0	0	0	298	0	0	0	293
	General Science	0	0	0	0	2,388	0	0	0	0	0	0	369	2,304
	Geothermal	0	0	0	0	0	0	0	0	0	0	0	0	178
	Improved Conversion Efficiency	0	0	0	0	0	0	0	0	88	0	0	0	88
	Multitechnology	0	0	0	0	240	0	0	29	0	0	0	0	268
	Ocean, Wind	0	0	0	0	0	0	0	0	0	0	0	0	29

TABLE II (Continued)

Funding Agency	Energy Technology	Exploration	Extraction	Secondary Recovery	Tertiary Recovery	Combustion In Situ	Conversion In Situ	Transportation Transmission	Storage	Processing	Conversion	Combustion Utilization	Waste Management	Decontamination Decommissioning	Non Applicable	Total
Department of Transportation (Continued)	Oil and Gas											304			772	
	Reuse of Solid Waste															
	Solar															
	SUBTOTAL	36						3,045			314	1,511			1,150	6,056
Environmental Protection Agency	Biomass															
	Biomass, Pyrolysis									75	210	76				488
	Coal Conversion, Gasification	1	230									117				117
	Coal Conversion, Liquefaction									494	1,429	375				2,537
	Conservation		252							104	1,574	369				2,099
	Electric							375			30	369			44	779
	End Use											151				151
	Fossil Fuels	995	9,077	320				25	312	3,682	1,565	30,864	1,577		841	52,552
	General Science		249							256	36	3,562	5,955		13,005	23,927
	Geopressurized		38								88	78	383			336
	Geothermal											34				34
	Hydroelectric															
	Improved Conversion Efficiency															
	Medical Applications of Nuclear Technology									211			85		50	336
	Multitechnology	18	825					195	67	2,215	63	12,154	11,621	388	2,092	29,039
	Nuclear										334	679	88		7	1,088
	Ocean, Wind															2
	Oil and Gas	235	2,956					805		705	352	3,396	245		235	11,000
	Oil Shale	111	1,403						17	363	829	30,243	333			33,020
	Reuse of Solid Waste									192	350	282	182			1,709
	Solar											586				586
	Other		85													85
	SUBTOTAL	1,393	13,419	252				1,404	362	7,998	6,864	92,986	20,532	382	17,673	160,871
Other[c]	Fossil Fuels												2,043		25	2,068
	General Science														252	252
	Multitechnology										888					888
	Nuclear															
	SUBTOTAL										1,290		2,043		327	3,570
Department of Health and Human Services	Biomass														14	14
	Coal Conversion, Gasification										48					48
	Coal Conversion, Liquefaction															
	Conservation											25				25
	Fossil Fuels		38							21	85	5,319	130		281	5,855
	General Science											9,221			9,080	18,301
	Geothermal											89				89
	Hydroelectric															
	Medical Applications of Nuclear Technology											845			3,854	4,699
	Multitechnology											38			237	275
	Nuclear		38							110		863			248	1,259

TABLE II (Continued)

Funding Agency	Energy Technology	Exploration	Extraction	Secondary Recovery	Tertiary Recovery	Combustion In Situ	Conversion In Situ	Transportation Transmission	Storage	Processing	Conversion	Combustion Utilization	Waste Management	Decontamination Decommissioning	Yet Applicable	Total
Department of Health and Human Services (Continued)	Oil and Gas	0	0	0	0	0	0	0	0	0	0	2,376	0	0	0	2,470
	Oil Shale	0	0	0	0	0	0	0	0	0	0	1,272	0	0	0	1,285
	Solar	0	0	0	0	0	0	0	0	0	0	483	0	0	59	542
	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	859	859
	SUBTOTAL	0	75	0	0	0	0	0	0	200	172	16,082	180	0	25,039	31,488
Department of Housing and Urban Development	Conservation	0	0	0	0	0	0	0	0	0	0	200	68	0	0	268
	Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reuse and Solid Waste	0	0	0	0	0	0	0	0	0	0	9,000	0	0	0	9,000
	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	0	9,200	75	0	0	9,275
National Aeronautics and Space Administration	Fossil Fuels	0	0	0	0	0	0	0	0	0	0	37	0	0	0	37
	General Science	0	0	0	0	0	0	116	0	0	0	9,393	0	0	328	9,841
	Multitechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil and Gas	0	0	0	0	0	0	115	0	0	0	0	0	0	0	115
	SUBTOTAL	0	0	0	0	0	0	231	0	0	0	9,430	0	0	328	9,993
Nuclear Regulatory Commission	End Use	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	Fission, Breeders	0	0	0	0	0	0	0	0	0	0	88	0	0	0	88
	Fission, Converters	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	General Science	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Radical Applications of Nuclear Technology	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	Multitechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nuclear	0	1,392	0	0	0	0	342	0	645	805	35,638	3,805	0	45,244	87,890
	SUBTOTAL	0	1,392	0	0	0	0	342	0	645	805	35,732	3,834	0	45,244	87,754
National Science Foundation	Biomass, Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	109	109
	Coal Conversion, Gasification	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conservation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Energy Storage	0	0	0	0	0	0	0	0	0	10	1,931	0	0	0	1,941
	Fossil Fuels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fusion, Laser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	General Science	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Multitechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil and Gas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reuse of Solid Waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	10	1,931	0	0	109	2,050
Office of Technology Assessment	Biomass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil Shale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Department of Health and Human Services (Continued)	Oil and Gas	0	0	0	0	0	0	0	0	0	0	2,376	0	0	0	2,470
	Oil Shale	0	0	0	0	0	0	0	0	0	0	1,272	0	0	0	1,285
	Solar	0	0	0	0	0	0	0	0	0	0	483	0	0	59	542
	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	859	859
	SUBTOTAL	0	75	0	0	0	0	0	0	200	172	16,082	180	0	25,039	31,488
Department of Housing and Urban Development	Conservation	0	0	0	0	0	0	0	0	0	0	200	68	0	0	268
	Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reuse and Solid Waste	0	0	0	0	0	0	0	0	0	0	9,000	0	0	0	9,000
	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	0	9,200	75	0	0	9,275
National Aeronautics and Space Administration	Fossil Fuels	0	0	0	0	0	0	0	0	0	0	37	0	0	0	37
	General Science	0	0	0	0	0	0	116	0	0	0	9,393	0	0	328	9,841
	Multitechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil and Gas	0	0	0	0	0	0	115	0	0	0	0	0	0	0	115
	SUBTOTAL	0	0	0	0	0	0	231	0	0	0	9,430	0	0	328	9,993
Nuclear Regulatory Commission	End Use	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	Fission, Breeders	0	0	0	0	0	0	0	0	0	0	88	0	0	0	88
	Fission, Converters	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	General Science	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Radical Applications of Nuclear Technology	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
	Multitechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nuclear	0	1,392	0	0	0	0	342	0	645	805	35,638	3,805	0	45,244	87,890
	SUBTOTAL	0	1,392	0	0	0	0	342	0	645	805	35,732	3,834	0	45,244	87,754
National Science Foundation	Biomass, Pyrolysis	0	0	0	0	0	0	0	0	0	0	0	0	0	109	109
	Coal Conversion, Gasification	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Conservation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Energy Storage	0	0	0	0	0	0	0	0	0	10	1,931	0	0	0	1,941
	Fossil Fuels	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Fusion, Laser	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	General Science	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Multitechnology	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Nuclear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil and Gas	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Reuse of Solid Waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	10	1,931	0	0	109	2,050
Office of Technology Assessment	Biomass	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Coal Conversion, Liquefaction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Oil Shale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Solar	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	SUBTOTAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 11 (Continued)

Funding Agency	Energy Technology	Exploration	Extraction	Secondary Recovery	Tertiary Recovery	Combustion In Situ	Conversion In Situ	Transportation Transmission	Storage	Processing	Conversion	Combustion Utilization	Waste Management	Decontamination Decommissioning	Not Applicable	Total
Tennessee Valley Authority	Biomass	0	0	0	0	0	0	0	0	0	0	166	0	0	0	166
	Biomass, Pyrolysis	0	0	0	0	0	0	0	0	0	0	9	0	0	0	9
	Conservation	0	0	0	0	0	0	0	0	0	288	0	0	0	0	288
	Fossil Fuels	0	0	0	0	0	0	0	44	0	288	423	977	0	1,046	2,778
	Hydroelectric	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Multitechnology	0	0	0	0	0	0	0	0	0	0	25	30	0	286	341
	Reuse of Solid Waste	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Other	0	0	0	0	0	0	24	0	0	20	8	25	0	0	77
	SUBTOTAL	0	0	0	0	0	0	24	44	0	596	631	1,032	0	1,332	3,659
	TOTAL	23,655	60,972	2,734	2,619	0	0	13,882	3,260	20,260	39,764	328,072	278,624	20,279	131,146	925,027

[a]Names for agency abbreviations are found in Appendix C.

[b]The term "Other" encompasses all projects which did not fit into the list of energy technologies provided in the questionnaire.

[c]Partial or complete funding for various projects was provided by nonfederal organizations. These are grouped under the term "Other."

the interest of HHS and NSF was more in the general fossil fuel category, OTA was highly supportive of combustion/utilization programs involved with coal liquefaction technology.

The combustion/utilization cycle, as applied to other energy technologies, was also of major concern to other agencies funding programs reported by the Federal Inventory. NASA reported that 94% of its dollars were used for research involving the combustion/utilization cycle. Nearly all NASA funds identified for combustion/utilization programs were concerned with general science. NRC exhibited a strong interest in the combustion/utilization cycle as related to nuclear technologies.

The extraction cycle was also of importance to funding agencies reporting their activities to the Federal Inventory. As one would expect, DOI reported that 35% of its funds were expended for research dealing with extraction processes, with 73% of these funds going to projects concerned with fossil fuel extraction. All reported projects funded by DOA were related to extraction, with half of these dealing with fossil fuel. Exploration was the main interest of DOC, with all exploration research relating to oil and gas technologies. The main reported funding effort for DOT was in support of research concerned with transportation and transmission. Waste management was the prime concern of TVA, especially as related to fossil fuels.

Analysis of the Federal Inventory data provides an in-depth description of energy-related environmental, health, and safety research and development for FY 1980. According to information obtained from responding agencies, the major funding agency for this program was DOE, with EPA also contributing substantial support. Nuclear-related programs received the most support, with fission being the nuclear energy technology of main concern. Fossil energy technologies were also well funded, with emphasis in the areas of oil and gas and oil shale research and development. Specific research categories of interest to funding agencies were environmental impacts evaluation, containment and transport of energy fuels and wastes, and biological effects in

experimental systems. Within the various energy technologies, the stages of the energy cycle receiving the most support were combustion/utilization and waste management. Radionuclides released during the energy cycle was the pollutant of most concern to energy-related research, with strong support also being provided for projects dealing with hydrocarbons and other organics. The effects produced by these and other pollutants were of most concern when they interacted with the atmosphere. The key issue to energy-related environmental, health, and safety research for FY 1980 was safety.

APPENDIX A

ACCESS TO THE FEDERAL INVENTORY DATA

ACCESS TO THE FEDERAL INVENTORY DATA

The FY 1980 Federal Inventory Data Base is available for on-line data retrieval on RECON, the DOE on-line retrieval system. To gain access to RECON, which is maintained by the DOE Technical Information Center, contact Mr. Thomas D. Sample, Technical Information Center, Oak Ridge, Tennessee, 615-576-1272. The Inventory is maintained as part of the Research in Progress File and consists of two files. One file contains administrative and funding data plus an abstract, while the second file contains the technical environmental data.

A complete listing of all projects plus indexes is available in Volume II of this year's publication. Volume I contains an overview of the data and discusses major trends in funding and research. Copies of the publication are available from the National Technical Information Service, U.S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia, 22161.

APPENDIX B

FY 1980 INVENTORY QUESTIONNAIRE

DOE F 0000.1
(7-80)

Interagency Report Control No. 0130-DOE-AN

U.S. DEPARTMENT OF ENERGY
INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENTAL AND SAFETY RESEARCH FOR FY 1980

INSTRUCTIONS

NOTE: If this project has been terminated, check the box for TERMINATED in question 2. and return this questionnaire and attached printouts.

1. **TITLE:** Use official title of project. Limit the length to a maximum of 100 characters plus spaces.

2. **PERFORMING ORGANIZATION CONTROL NUMBER:** The unique internal identification number used by the performing organization to facilitate project control. **PROJECT STATUS:** Check Status of project in FY 1980.

3. **CONTRACT, GRANT OR PURCHASE ORDER NUMBER:** The agency number under which the project is being performed. If no number is used, enter N/A for not applicable.

4. **PRINCIPAL INVESTIGATOR:** Name of person responsible for the performance of the project. Address is the mailing address of the principal investigator. Give telephone number.

5. **(A) PERFORMING ORGANIZATION:** Name of organization providing administrative, logistic, and/or facility support. State name of smallest organizational unit performing the research.

   (B) CODE for type of performing organization. From the following list, select ONE and enter the two-letter code on the form.

   IN - Private industry
   NP - Foundation or laboratory not operated for profit
   TA - Trade or professional association
   US - Federal agency
   CU - College, university or trade school
   ST - Regional, state or local government facility
   EG - Electric or gas utility
   FF - Federally funded R&D centers or laboratory operated for an agency of the U.S. Government
   XX - Other (define on questionnaire)

   (C) Name of the state(s) where work is being performed.

   (D) Country sponsoring the project.

6. **MONITORING ORGANIZATION:** List the full name of the organization/agency and division that has direct contact with the principal investigator, the technical representative who directly monitors the work, his address if different from Washington, D.C. headquarters and phone number, and the specific person administering the grant or contract.

7. **PROJECT SCHEDULE:** If the project is a continuation of a previous project, list the start date indicating the initiation of the prior work. The expected completion date should be entered. If the project is a continuing activity with no set completion date, enter N/A for not applicable.

8. **FUNDING:** Provide funding in **DOLLARS.** If funding is received from more than one organization or through a pass-thru mechanism, list each agency with its respective funding separately in the space provided. Funding should indicate budget obligations (funding level) per year. For example, if budget obligation is $20,000 for 2 years, state the funding levels as $10,000 per year. If FY 1980 funding is not available, enter **NOT AVAILABLE** in the appropriate box. If applicable, fill in parts, D, E, F, or G.

9. **SUMMARY OF WORK:** Provide a project summary in 200 words or less. To provide an accurate summary, restrict the length to the allowable limit as summaries over 200 words will be reduced to the maximum limit. State project objectives, significance, approach, and final product expected in terms of its relevancy to the technology, specific health and environmental effects research, quantifying where possible (e.g., "demonstrates 95% of recovery of sulfur from raw gas with molten salt recycle at a rate of one gallon per minute").

10. **PUBLICATIONS:** List the five major publications from the past 12 months which are available to the public that have resulted directly from the research. Give author(s), year, title, journal reference or report number, and source from which publications may be secured. Do not list papers to be published in the future.

11. **GENERAL TECHNOLOGY CATEGORY:** Enter the letter and number in the first row of boxes for the general technology category supported by your project as shown below. Multiple numbers may be entered when the project supports more than one category. The Multi-Technology category (Item F1) should be used only if your project has a pervasive application or influence on all, or nearly all, technology areas. Examples: R&D on instrumentation, materials research, meteorological research. The General Science category (Item F2) should be used only if your project, or a major portion of it, is basic in nature and not directly related to any specific energy technology. In the box directly under the one(s) in which a code is entered, indicate the percent of the total funding for each technology. Do not enter less than 10 percent for any technology. Percents must total to 100.

Insert one or more of the following category codes:

Fossil Fuels (including synfuel)

A1 - Fossil Fuels (general)
A2 - Coal Conversion - Liquefaction
A3 - Coal Conversion - Gasification
A4 - Oil and Gas
A5 - Oil Shale
A6 - Biomass - Pyrolysis

Geothermal

C1 - Geothermal (general)
C2 - Hydrothermal
C3 - Geopressurized
C4 - Hot Dry Rock

Conservation

E1 - Conservation (general)
E2 - End Use
E3 - Improved Conversion Efficiency
E4 - Energy Storage
E5 - Reuse of Solid Waste

Nuclear

B1 - Nuclear (general)
B2 - Fission - Converters
B3 - Fission - Breeders
B4 - Fusion - Magnetic
B5 - Fusion - Laser

Solar

D1 - Solar (general)
D2 - Direct Heat/Cool
D3 - Electric
D4 - Ocean Wind
D5 - Biomass

Other

F1 - Multi-technology
F2 - General (or Basic) Science
F3 - Medical Applications of Nuclear Technology
F4 - Hydroelectric
F5 - Other (identify on the form)

12. **TYPE OF RESEARCH ACTIVITY:** Check the ONE type of research activity that is most applicable to this project.

13. **KEYWORDS:** List five terms describing the technical aspects of the project.

14. **ANALYTICAL / PAPER STUDY:** Identify this project as being a paper or experimental study.

15. **RESPONDENT:** Name and address of person filling out the questionnaire. Give telephone number, including extension (if you have FTS number, please include it) at which respondent can be reached. Record the date the form was completed. The information in item 15 will not be published.

16. **STAGE OF ENERGY RESEARCH CYCLE:** Check the type of energy research cycle(s) that are most applicable to this project.

17. **POLLUTANTS:** Check the pollutant(s) which are DIRECTLY related to this project. If "other" is checked, also specify the pollutant.

18. **MEDIA:** Check the media to which the pollutants indicated in item 17 directly relate either through deposition, cycling, fate and/or effects.

R&D CATEGORIES: Questions 19, 20, and 21 relate to three main R&D categories: ENVIRONMENTAL AND SAFETY CONTROL TECHNOLOGY, TECHNOLOGY IMPACTS OVERVIEW AND ASSESSMENT, and BIOLOGICAL AND ENVIRONMENTAL R&D AND ASSESSMENTS. Choose the ONE question pertaining to the ONE R&D category which is directly related to this project and check the ONE applicable area within that category.

DEFINITION FOR ITEM 19: Activities directed at developmental engineering, demonstration and evaluation of processes and systems to mitigate environmental impacts from emissions, effluents, and discharges from energy systems and packaging, shipping, and disposal of energy fuels and wastes.

DEFINITION FOR ITEM 20: Assessment and information dissemination activities directed at determining the impact of environmental policies, laws and regulations of energy development and use upon the nation's environment, health, and safety.

DEFINITION FOR ITEM 21: Research directed towards developing the information required for an understanding of possible short-term or long-term consequences to man and his environment of the various energy technologies associated with the production, utilization or conservation of energy.

22. **ISSUES:** Check the ONE issue which this project directly addresses.

INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENTAL AND SAFETY RESEARCH FY 1980

FOR OFFICE USE ONLY

LOG NUMBER

1. DESCRIPTIVE TITLE

2. PERFORMING ORGANIZATION CONTROL NUMBER

STATUS OF WORK: ☐ NEW ☐ CONTINUING ☐ TERMINATED

3. CONTRACT, GRANT OR PURCHASE ORDER NUMBER

4. PRINCIPAL INVESTIGATOR AND ADDRESS

A. NAME (LAST, FIRST, MI)

B. PHONE FTS -

COM -

C. AFFILIATED ORGANIZATION

D. CITY

BUSINESS ADDRESS: STREET

F. ZIP

E. STATE

5. A. PERFORMING ORGANIZATION:

ORGANIZATION

DEPARTMENT

B. CIRCLE ONE CODE FOR TYPE OF ORGANIZATION PERFORMING R & D (SEE INSTRUCTIONS)

CU EG FF IN NP ST TA US XX

C. STATE WHERE WORK IS BEING PERFORMED

D. COUNTRY SPONSORING PROJECT

6. A. MONITORING ORGANIZATION, PROGRAM DIVISION, OR OFFICE (FULL NAME)

B. TECHNICAL MONITOR (LAST, FIRST, MI)

C. PHONE FTS -

COM -

D. ADDRESS (IF DIFFERENT FROM HQS.)

E. ADMINISTRATIVE MONITOR (LAST, FIRST, MI)

7. PROJECT SCHEDULE

A. START DATE MONTH YEAR

B. EXPECTED COMPLETION DATE MONTH YEAR

INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENTAL AND SAFETY RESEARCH

ORGANIZATION CONTROL NUMBER _____

8. FUNDING IN DOLLARS, i.e., $10,000 (FUNDS REPRESENT BUDGET OBLIGATION). ENTER "NOT AVAILABLE" IN THE APPROPRIATE BOX IF FY 1980 FUNDING IS NOT KNOWN.

	FUNDING ORGANIZATION(S)	FY 1980	ESTIMATED FY 1981
A.			
B.			
C.			

D. FOR DOE PROJECTS, ENTER BUDGETING AND REPORTING CLASSIFICATION CODE _____

E. INTERAGENCY AGREEMENT (SPECIFY FUNDING AGENCY) _____

F. AGENCY IN-HOUSE EFFORT (CHECK IF APPLICABLE) ☐

G. EPA "PASS-THRU" FUNDING (CHECK IF APPLICABLE) ☐

9. DESCRIPTIVE SUMMARY OF WORK. *LIMIT TO 200 WORDS.* INCLUDE OBJECTIVE, APPROACH, RESULTS TO DATE, AND EXPECTED PRODUCT. QUANTIFY WHERE POSSIBLE. SUMMARIES OVER 200 WORDS WILL BE CUT TO THE ALLOWABLE LIMIT.

INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENTAL AND SAFETY RESEARCH

ORGANIZATION CONTROL NUMBER _____

10. LIST THE FIVE MAJOR PUBLICATIONS FROM THE LAST 12 MONTHS WHICH ARE AVAILABLE TO THE PUBLIC AND HAVE RESULTED DIRECTLY FROM THE PROJECT. GIVE A COMPLETE BIBLIOGRAPHIC CITATION.

11. GENERAL TECHNOLOGY CATEGORIES (ENTER APPLICABLE CODE IN THE FIRST ROW OF BOXES FROM CODES IN THE INSTRUCTIONS. ENTER THE PERCENT FOR EACH TECHNOLOGY IN THE SECOND ROW OF BOXES. PERCENTS MUST TOTAL 100.

☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

12. TYPE OF RESEARCH ACTIVITY (CHECK ONE ACTIVITY)

A.	☐	Basic Research	F.	☐	Pilot Plant Scale R & D	K.	☐	Policy Analysis
B.	☐	Applied Research	G.	☐	Full Scale Demonstration	L.	☐	Socioeconomic
C.	☐	Laboratory Scale R & D	H.	☐	Mathematical Model Development	M.	☐	Other (Specify) _____
D.	☐	Technology Transfer	I.	☐	Data Analysis / Assessments	N.	☐	Not Applicable
E.	☐	Field Study	J.	☐	Information Systems Management			

13. KEYWORDS (Please list 5 keywords)

14. IS THIS RESEARCH PROJECT SOLELY AN ANALYTICAL / PAPER STUDY? (NON-EXPERIMENTAL, PAPER AND PENCIL, COMPUTER ANALYSIS, ETC.) _____YES _____NO

15. RESPONDENT'S NAME _____ **PHONE** _____ **DATE** _____

BUSINESS ADDRESS:

STREET _____

CITY _____ **STATE** _____ **ZIP** _____

INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENTAL AND SAFETY RESEARCH

ORGANIZATION CONTROL NUMBER _____

16. STAGE OF ENERGY RESEARCH CYCLE (CHECK APPLICABLE CYCLE(S))

- A. ☐ Exploration
- B. ☐ Extraction
- C. ☐ Secondary Recovery
- D. ☐ Tertiary Recovery
- E. ☐ Combustion in situ
- F. ☐ Conversion in situ
- G. ☐ Transportation / Transmission
- H. ☐ Storage
- I. ☐ Processing
- J. ☐ Conversion
- K. ☐ Combustion - Utilization
- L. ☐ Waste Management
- M. ☐ Decontamination / Decommissioning
- N. ☐ Not Applicable

17. POLLUTANTS (CHECK APPLICABLE POLLUTANTS)

- A. ☐ Sulfur Compounds
- B. ☐ Nitrogen Compounds
- C. ☐ Carbon Oxides (CO, CO_2)
- D. ☐ Hydrocarbons and Other Organics
- E. ☐ Photochemical Oxidants
- F. ☐ Particulates/Aerosols
- G. ☐ Trace and Heavy Metals
- H. ☐ Mixtures of Defined Pollutants
- I. ☐ Radiation, Ionizing (electromagnetic)
- J. ☐ Radiation, Nonionizing (U.V., electric, magnetic, etc.)
- K. ☐ Radionuclides
- L. ☐ Noise / Vibration
- M. ☐ Heat / Thermal
- N. ☐ Odor
- O. ☐ Complex Mixtures (e.g. process steam materials)
- P. ☐ Solid / Liquid Wastes and Residuals
- Q. ☐ Microorganisms
- R. ☐ Other (Specify) _____
- S. ☐ Not Applicable

18. MEDIA TO WHICH POLLUTANTS RELATE (CHECK APPLICABLE MEDIA)

- A. ☐ Atmospheric
- B. ☐ Terrestrial
- C. ☐ Freshwater
- D. ☐ Groundwater
- E. ☐ Estuarine
- F. ☐ Marine
- G. ☐ Not Applicable

19. ENVIRONMENTAL AND SAFETY CONTROL TECHNOLOGY R & D. IF DIRECTLY RELATED TO THIS PROJECT, CHECK THE ONE APPLICABLE AREA. IF THIS QUESTION IS ANSWERED, DO NOT ANSWER QUESTION 20 OR 21.

- A. ☐ Air Emission Controls
- B. ☐ Solid Waste Management and Land Reclamation
- C. ☐ Water Control and Protection
- D. ☐ Decontamination/Disposal of Equipment and Facilities
- E. ☐ Energy Fuels and Wastes Containment and Transport
- F. ☐ Plant/Mine Operational Safety

INVENTORY OF FEDERAL ENERGY-RELATED ENVIRONMENTAL AND SAFETY RESEARCH

ORGANIZATION CONTROL NUMBER _____

20. TECHNOLOGY IMPACTS OVERVIEW AND ASSESSMENT. IF DIRECTLY RELATED TO THIS PROJECT, CHECK THE ONE APPLICABLE AREA. IF THIS QUESTION IS ANSWERED, DO NOT ANSWER QUESTION 19 OR 21.

A. ☐ Policy analysis (Energy-related implications of proposed and existing federal and regional environmental health and safety policies and laws.)

B. ☐ Technology Assessment (Environmental research planning and review documentation to address concerns of specific technologies and processes.)

C. ☐ Environmental Impacts Evaluation (Determining, evaluating, and assessing environmental impacts of energy development, including NEPA process.)

D. ☐ Regional Assessment (Regional evaluation of energy resources and uses.)

E. ☐ Social Impacts (Including economic, institutional, political and resource utilization.)

F. ☐ Information Dissemination (Publications, meetings, information systems, coordination and public participation activities.)

G. ☐ Standards Development (Criteria, guidelines and regulations.)

21. BIOLOGICAL AND ENVIRONMENTAL R & D AND ASSESSMENTS. IF DIRECTLY RELATED TO THIS CATEGORY, CHOOSE THE ONE APPLICABLE AREA WITHIN THE RELATED MAIN SUBJECT. IF "H" IS CHOSEN, CHECK THE APPLICABLE SUBCATEGORIES. IF THIS QUESTION IS ANSWERED, DO NOT ANSWER QUESTION 19 OR 20.

Pollutant Characterization, Measurement, and Monitoring

A. ☐ Characterization and Analysis

B. ☐ Monitoring (Workplace or Environment)

C. ☐ Measurements Technology

D. ☐ Physical/Chemical Mechanisms of Pollutant Interactions

Health Studies

E. ☐ Clinical Studies in Humans

F. ☐ Epidemiological Studies

G. ☐ Health Protection, Safety and Industrial Hygiene

H. ☐ Biological Effects in Experimental Systems

I. ☐ Health Effects Assessments

Environmental Studies

J. ☐ Environmental Transport and Conversion of Pollutants

K. ☐ Ecological Effects of Pollutants or Physical Disturbances

L. ☐ Environmental Effects Assessments

22. ISSUE CATEGORY. CHECK THE AREA OF ENVIRONMENTAL CONCERN TO WHICH THIS RESEARCH PROJECT APPLIES MOST DIRECTLY.

A. ☐ Air Quality

B. ☐ Water Resources (Quality, Quantity)

C. ☐ Land Disturbances (Include waste management and reclamation

D. ☐ Ecology

E. ☐ Climate

F. ☐ Health (Public, Occupational)

G. ☐ Safety (Public, Occupational)

H. ☐ Societal Impacts

I. ☐ Multi-Issue

APPENDIX C

AGENCY ABBREVIATIONS

AGENCY ABBREVIATIONS

Abbreviations	Agency
CEQ	Council on Environmental Quality
DOC	Department of Commerce
DOD	Department of Defense
DOE	Department of Energy
DOI	Department of the Interior
DOT	Department of Transportation
EPA	Environmental Protection Agency
HHS	Department of Health and Human Services
HUD	Department of Housing and Urban Development
NASA	National Aeronautics and Space Administration
NRC	Nuclear Regulatory Commission
NSF	National Science Foundation
OTA	Office of Technology Assessment
TVA	Tennessee Valley Authority
USDA	Department of Agriculture